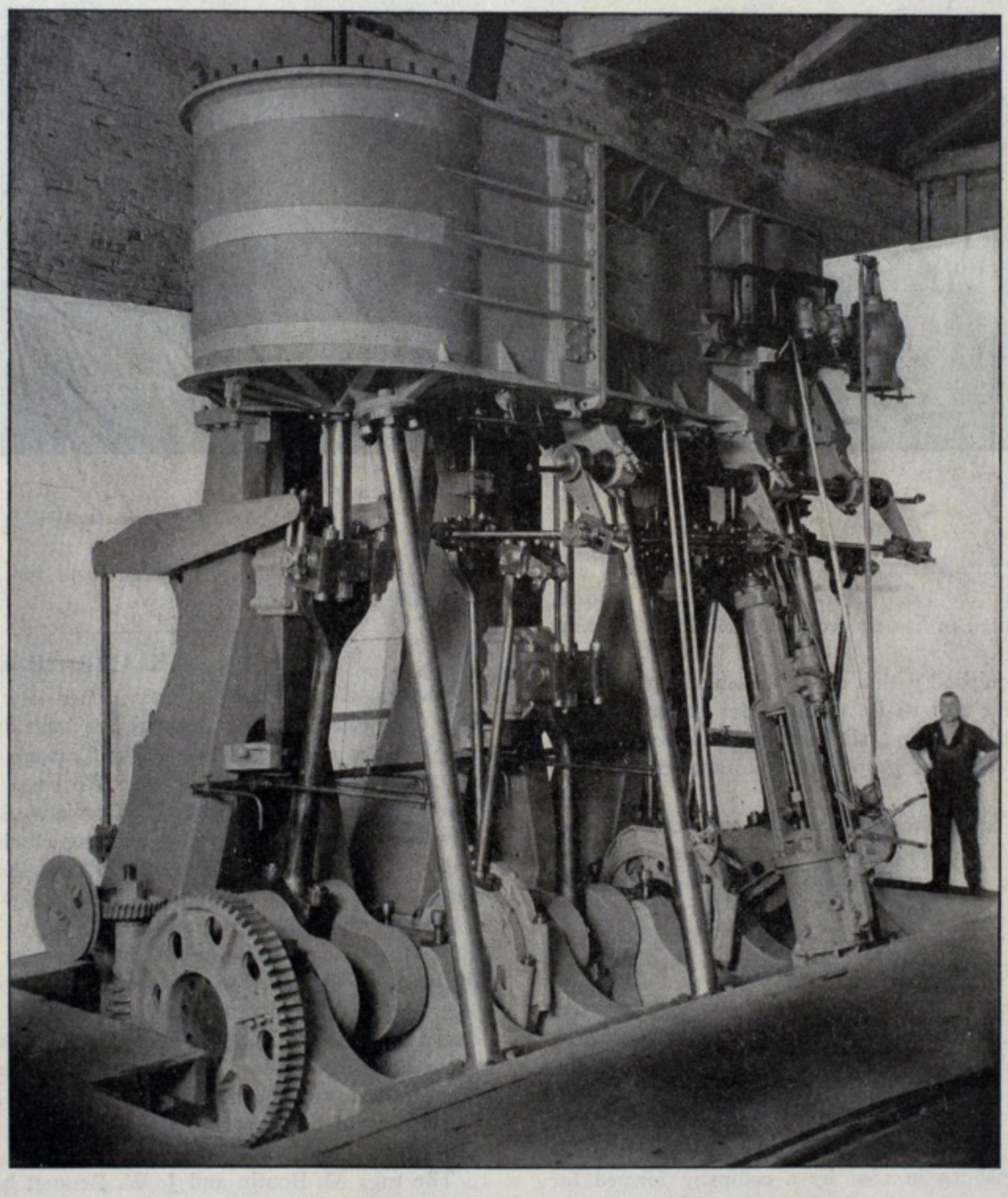
VOL. XXIX. CLEVELAND, O., JUNE 2, 1904. No. 22.

STEAMER LEWIS LUCKENBACH.

The steamer Lewis Luckenbach, built for Lewis Luckenbach of New York, by John H. Dialogue & Son, Camden, N. J., for the general coasting trade is a much more shapely ship than the ordinary type of cargo carrier, and is designed especially for carrying heavy loads on light draught. She is 362 ft. over all, 48 ft. beam and 28 ft. deep. She is built under classification and special survey of Lloyds Register of British and Foreign Shipping to their highest class for sea-going service. She is designed under the three-deck rule, having two complete steel decks and steel bridge deck with beam on each frame and deep framing. There is the usual topgallant forecastle, full poop and long bridge house.

She has double bottom on the cellular system running clear fore and aft and the forward end of the vessel is especially stiffened for pounding in heavy seas and for ice. There are four main cargo holds besides the space in the poop and in the 'tween decks alongside of machinery and bridge house. The hatches are 16 ft. by 24 ft. with high coamings and with braces at side. There are eight hoisting engines with separate derrick for each for rapid handling of cargo. The masts are of steel.



ENGINES OF THE LEWIS LUCKENBACH.

[Built by John H. Dialogue & Son, Camden, N. J.

The engines are of the triple-expansion type, having cylinders 26 in., 42 in. and 68 in. in diameter for a working pressure of 180 lbs. The engines are specially constructed so as to be easily accessible for repairs, having open fronts, pumps and condenser independent of the main engine. The crank shaft is in three sections

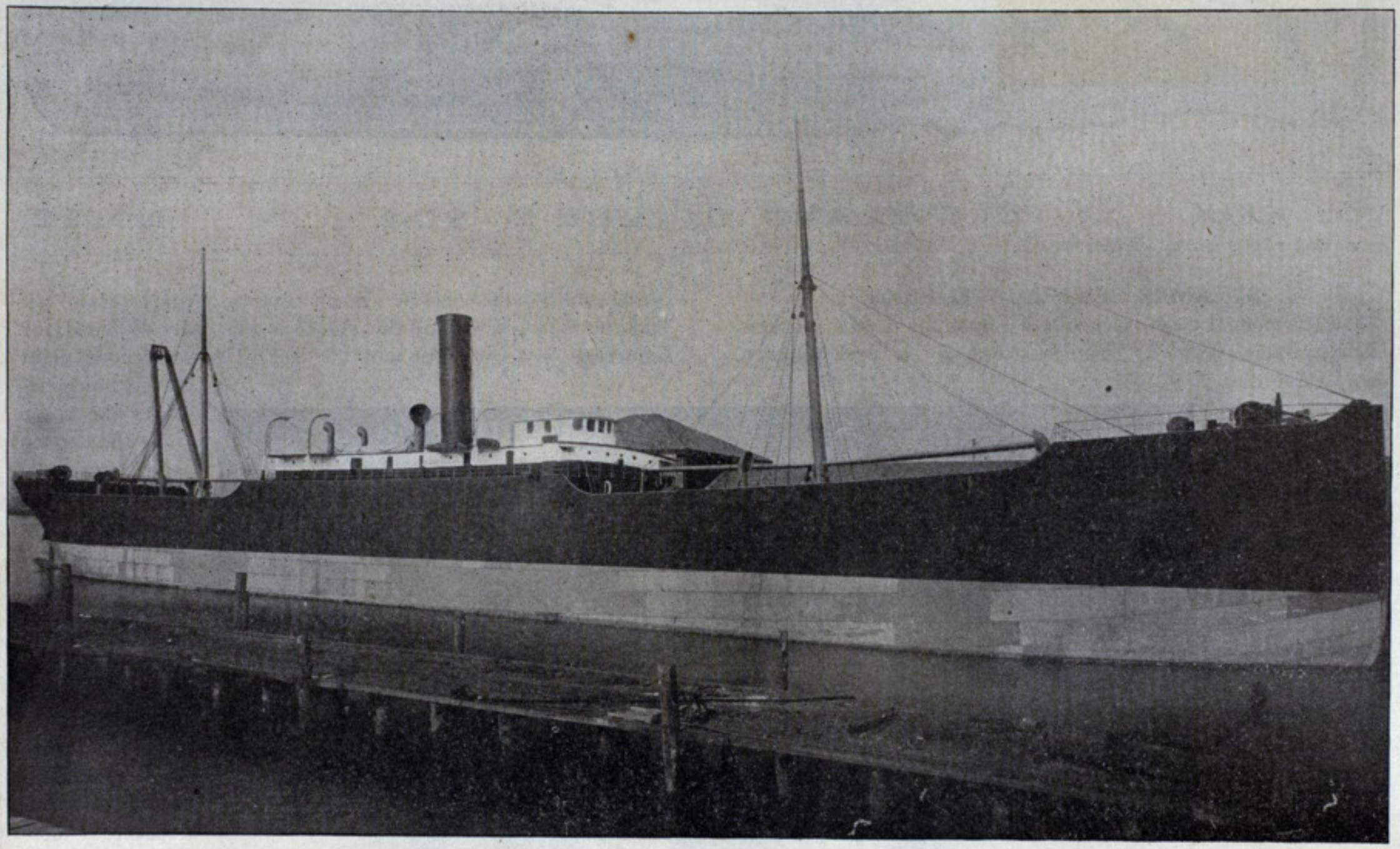
of interchangeable type, the high and intermediate pressure having piston valves and the low pressure double ported slide.

The circulating pump is independent of the centrifugal type. The feed pump is independent of vertical duplex type. Double ballast pumps have been fitted so that either or both can be used to pump out the tanks. Feed water heater, filter and evaporator have also been supplied. The thrust bearing is very large of horse-shoe type.

The Luckenbach has three main boilers of the Scotch type 14 ft. 2 in. diameter, 10 ft. 8 in. long, having three corrugated furnaces, and each furnace having a separate connection. The working pressure is 180 lbs. The donkey boiler is vertical, cross flue type, located in 'tween decks suitable for a working pressure of 120 lbs.

The steamer is equipped with a direct driven steam windlass of Hyde pattern for 2 1-16 in. chain. Her steam steering gear is of the Williamson type. Differential hand screw steering gear is fitted on top of poop with quadrant and steering relieving gear.

Special care has been taken in designing the deck house to provide commodious accommodations for officers and crew. The accommodations for sailors and firemen is in the topgallant forecastle.



STEAMER LEWIS LUCKENBACH.

[*Built by John H. Dialogue & Son, Camden, N. J.*

AN OLD TIME STEAMBOAT.

The best vessels of early steamboat days on the great lakes were built on Lake Ontario, and it is certainly surprising to note how the power and speed of some of the side-wheelers that were engaged as far back as sixty years ago for the Lake Ontario-St. Lawrence river trade. From an old newspaper clipping it is learned that the steamer United States was built in Ogdensburg in 1831 by a company formed for that purpose and known as the St. Lawrence Steamboat Co., and was launched Nov. 17, 1831. This steamer was 150 ft. long on deck, 26 ft. beam, 10 ft. depth of hold, and measured about 450 tons. She had two beam engines, 40 in. diameter and 8 ft. stroke. Wheels were 18 ft. diameter, 9 ft. face of bucket; draught of water 8 feet. She had two boilers on deck—one on each side of her guard forward of the wheel. Her speed was 10 to 12 miles an hour. Consumption of fuel (wood) was about 130 cords each trip from Ogdensburg to Lewiston and return. William Capes of New York was the ship carpenter and William Avery of Syracuse built her engines. Capt. Elias Trowbridge of Oswego was her first commander and Capt. Bates from the Canada side was her sailing master.

THE OLD STEAMER ARROW.

The old steamer Arrow was in her day the swiftest and best on the lakes. The steamer was built at Trenton, Mich., by Eli Bates and towed to Cleveland, where she was equipped with her engines at the Cuyahoga Works, a concern that was bought fifteen years ago by the Cleveland Ship Building Co., now a part of the lake ship building combination. A low-pressure, 40-in. cylinder with 9-ft. stroke installed in her, together with an iron boiler 24 ft. long and 9 ft. wide. Cordwood was the prevailing fuel in those days. She ran between Port Huron and Toledo in 1848 and between Detroit and Sandusky from 1849 to 1852. From 1853 to 1856 she was on the Detroit and Toledo route and from 1857 to 1859 she ran between Buffalo and Niagara Falls. She was 185 ft. long, 24 ft. beam and 9½ ft. deep. In 1859 her engine was taken out and placed in the steamer Dunlap—and thus endeth the steamship career of the Arrow.

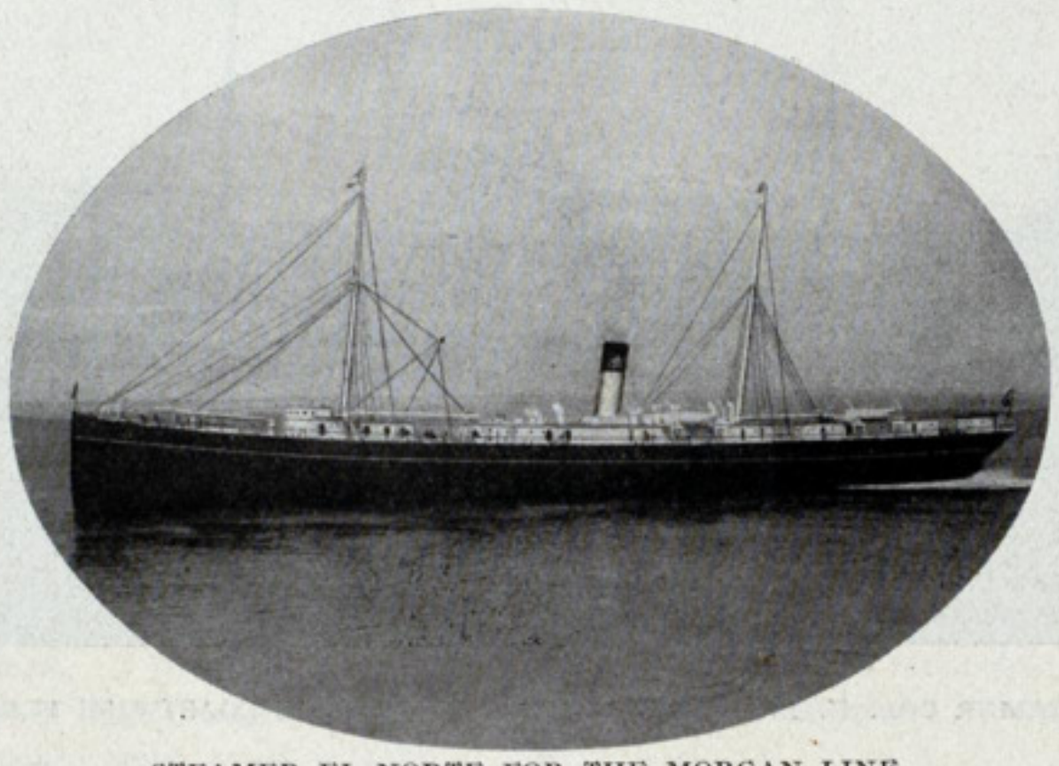
The tugs M. Boutin and J. W. Bennett have been sold respectively to Coling Bros. and George Nau at Green Bay.

THE DEVELOPMENT OF THE FREIGHT CARRIER IN THE ATLANTIC COASTWISE TRADE.

By Ray Morris.

THE FIRST CARRIER TO VISIT AMERICAN SHORES.

In the early days of coastwise navigation on the Atlantic, the water route was not only the most direct, but, in many cases, the only means of rapid transit between ports, and the vessels of the first regularly established steamship lines on the coast were as distinctively carriers of passengers and mails as are the express transatlantic steamers of the present time. Low class freight, that could not pay the high rates charged on the steamers, went on the sailing vessels, and the schooner fleet found plenty of profitable business, serving as an important adjunct to the steam service. In August, 1902, the writer contributed figures to the Marine Review showing that the largest number of schooners arrived at the port of New York in a single week during the month of March, 1902, selected as characteristic, was forty-seven, while as far back as 1852, 189 schooners arrived in a single week. The difference between these figures shows well how the importance of sailing vessels in the coastwise trade has fallen off; formerly they got all but the highest class of freight, at good rates, while now, following after the railroad and the coasting steamer, respectively, they must dispute with the towed barge for the lowest class freight of all.



STEAMER EL NORTE FOR THE MORGAN LINE.
[*Built by the Newport News Ship Building & Dry Dock Co., Newport News, Va.*

Perhaps the closest old-time parallel to the present function of the coastwise steamship lines, although performed by vessels of a very different type, was the water freight service between New York and Philadelphia in the '60s and '70s. In the early '70s, four or five steamers cleared daily between these ports, in each direction, on the Lorillard, Clyde, and independent lines. Most of these boats, which were of insignificant type, went by the canal route, but a few of the larger ones, such as Lorillard's Benefactor, Regulator and Fanita formerly went around the capes and up the Delaware. The similarity between the service performed by these boats and the service performed by coastwise steamers of the present day lay in the fact that there was through rail connection between the ports and the passenger trains made so much quicker time than the boats that the latter did not get any passenger business of importance. The side-wheel passenger steamers which ran on this route in the '50s did not long survive railroad competition, and were succeeded by a fleet of small propellers, mostly wooden, many of which were little more than canal boats or lighters. Lorillard's Benefactor, afterwards taken over by the Clydes, and still running on the route, was the best of the Philadelphia fleet. She was an iron propeller of 844 tons, gross.

The change in the status of the New York and Philadelphia fleet as a result of the establishment of through railroad service thus illustrated, more than a generation ahead, a principle which has recently had much weight in the development of coastwise steamers: that it is usually unprofitable to try to compete with through railroad lines for high-class traffic. A few important exceptions to the working out of the rule will be noted later. But the traveler of the present day, who hears much about American railroads and their 200,000 miles of main line, scarcely realizes how recent a development through lines are, especially to the South. In the '70s and early '80s the common gauge of the railroads on the Atlantic coast south of Richmond was 5 ft., while the gauge principally used in the North was 4 ft. 8½ in., as at present. It was not until 1887 that the South Carolina Railroad and the North Eastern Railroad, constituting the only rail approaches to Charleston from the north and west, were changed to standard gauge; prior to that time freight traffic had either to break bulk at the junction, or the car bodies had to be placed on different trucks.

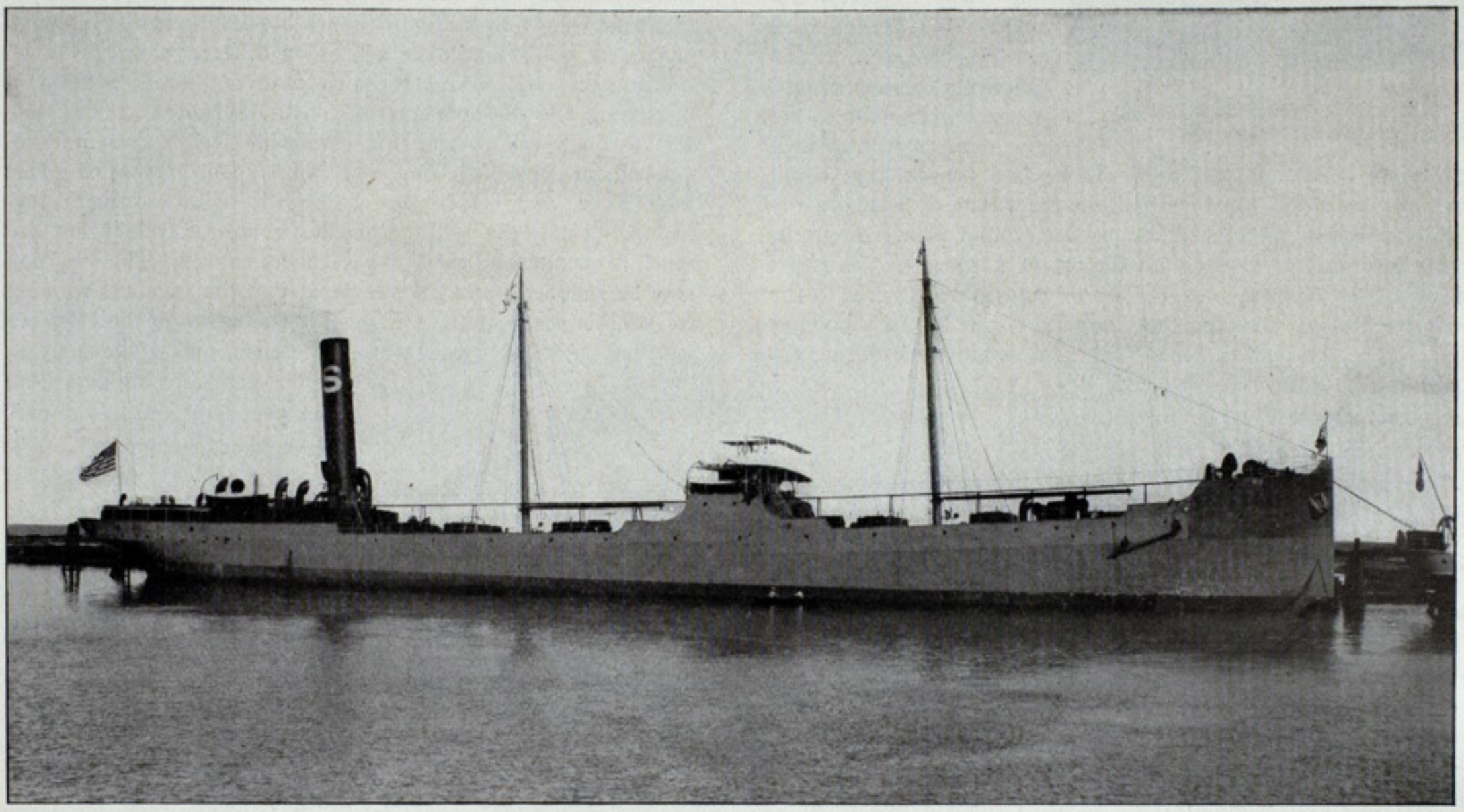
It is necessary to keep these railroad conditions in mind in discussing the development of coastwise freight traffic. The fast through rail service for perishable freight was not developed for some little time after the standardization of gauge took place, and before the change, the coast steamers furnished not only the best and quickest route for freight, but had much to recommend them to passengers as well. The situation may be summed up in the statement that the steamers running to Atlantic ports south of Cape Hatteras were, in the '50s, '60s and '70s, built for speed, while since then, and particularly in recent years, the builders have been primarily concerned with low coal consumption. The fine side-wheel steamers of the type of the Quaker City made record runs of 48 and 50 hours to Charleston prior to the civil war, carrying passengers and the mails, and their average running time was faster than that of any Clyde liners of the present day, except the Comanche, Apache and Arapahoe.

In 1864 the Metropolitan Line built the Neptune, a wooden propeller of 1,848 gross tons, for service between New York and Boston. The Nereus and the Glaucus were sister ships, and a regular freight service was established with these three vessels. They never carried passengers, and none of the subsequent ships of the line have been fitted with passenger accommodations, so the Metropolitan may be named as the first coastwise line to equip itself definitely for freight service exclusively. The vessels of the Neptune type were fitted with a single cylinder, low-pressure engine, and, with a dead weight carrying capacity of approximately 750 tons in service, burned from 50 to 55 tons of coal per round trip, New York and Boston, 584 miles, including what was burned in port.

In the '70s there were several lines to the New England coast which were primarily freight carriers, although some passenger accommodations were provided. Among these may be mentioned Ferguson & Wood's New York and New Bedford line, worked with the Wamsutta and the Acushnet, wooden propellers of about 325 tons. The well-known firm of Murray & Ferris, in addition to their fast passenger service to Savannah, tried subsidiary lines to various ports also, and at one time maintained independent services to Salem, Mass., and to Newbern, N. C. The Alliance, the best of the two boats running to Salem, was an iron propeller of 413 tons; the Zodiac, the largest of their Newbern boats, had seen a variety of services, and was a wooden propeller of 606 tons.

In 1875 the Brashear (afterwards enlarged and named Lone Star) and the New York were built for Mr. Charles

Morgan by the Harlan & Hollingsworth Co., and were the pioneers of the Morgan Line between New York and New Orleans, although Mr. Morgan worked a number of smaller steamers in the Gulf. The Morgan Line is now owned by the Southern Pacific Railroad, and is the most important freight line on the coast. It is rather surprising that the vessels of the rapidly increased Morgan fleet should not have been fitted with passenger accommodations, but there, again, the influence of the railroad lines was felt. The water route is, and always has been, by far the quickest and cheapest route for bulk freight from New York to the gulf, although an express rail service is maintained, nearly on passenger schedule, via Washington, Atlanta, Montgomery and the Louisville & Nashville. But in 1875 the Cromwell Line had a well-equipped passenger service between the ports, and Mr. Morgan did not care to compete for that part of the business with the Cromwell Line and the railroads as well.



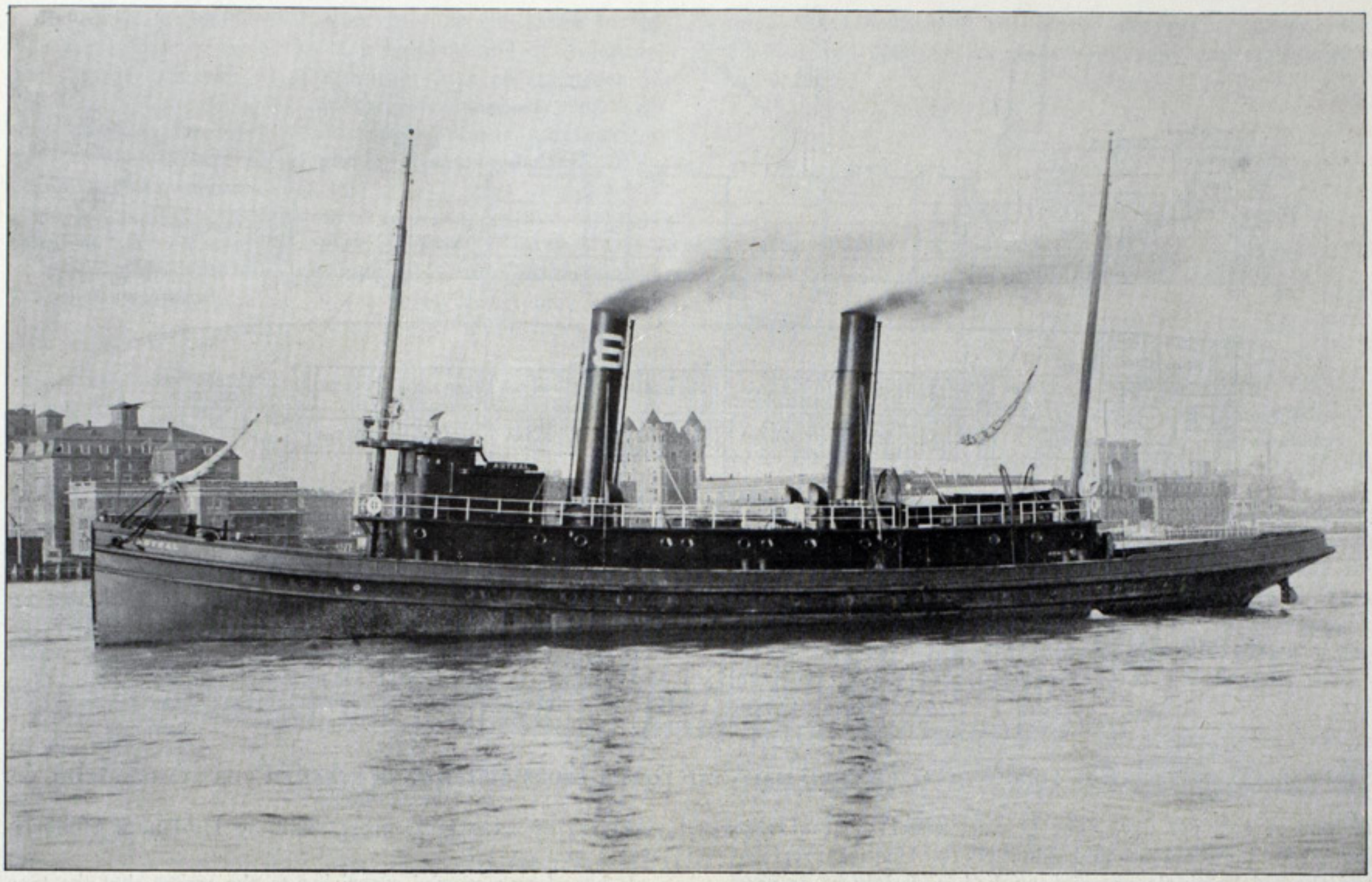
STEAMER COL. E. L. DRAKE, STANDARD OIL CO.'S COASTWISE FLEET.

The Brashear and New York, as first built, were of 1,735 tons; 275 ft. by 38 ft. 4 in. by 22 ft. 9 in., with surface condensing engines 50 in. by 60 in. They were followed in 1876 by the Algiers and Morgan City, sister ships, which were also subsequently altered by adding one deck. The Chalmette, built by Wm. Cramp & Sons, in 1879, was the first vessel of the fleet with compound engines.

There were also three, more or less regular, lines to Wilmington, N. C., in the '70s, worked primarily for freight, although some passenger business was picked up as well, on some of the ships. The Regulator and Fanita of Lorillard's Line, the Metropolis of Lunt's Line, and the Wilmington & Charlotte S. S. Co.'s Francis Wright made runs in this service. The Metropolis was a wooden propeller of 880 tons; the other vessels were slightly smaller, although two of them, the Regulator and the Fanita, had iron hulls. After the Clyde interests absorbed the Lorillard Line, they added the Gulf Stream, an iron propeller of 1,000 tons, but the service cannot be classed as a freight service, since there was some passenger traffic as well.

During the '80s, the development of the freight carrier on the coast was chiefly shown in the introduction of compound engines and the exclusive use of iron hulls. The side-wheelers had been abandoned a decade or more previous, but two examples of this type still survived, the Wyanoke and Old Dominion of the Old Dominion Line to Norfolk. The last named vessel is now running on the Fay Line, between New York and Boston, presenting an interesting contrast to the type of the present day. Space forbids an extended discussion of the reason why side-wheel coastwise steamers were built here in America long after the type was abandoned abroad; the elemental reason seems to have been a certain conservatism among American builders, due in no small part to a very imperfect knowledge of results obtained elsewhere, and of the methods by which they were obtained. Between 1880 and 1890, the fast ships of former times, representing the best possibilities of marine construction of their day, were no longer emulated, although certain lines, the Morgan and Metropolitan in particular, were building vessels which were certainly to be classed as fast freight carriers. The Excelsior and Chalmette of the Morgan Line, followed by El Dorado, El Paso, El Monte and El Mar, were the notable freight carriers of the period, while the Herman Winter, H. F. Dimock and H. M. Whitney, of the Metropolitan Line, maintained a 14-knot service between New York and Boston; in fact, the H. M. Whitney, of 2,707 tons, built at Philadelphia in 1890, was a 15-knot boat. The H. F. Dimock, built at Cramp's in 1884, and the Herman Winter, in 1886, were sister ships of 2,626 gross tons. El Mar, 3,531 gross tons, built at Cramp's in 1889, was also a 14-knot ship; El Monte, El Dorado, El Paso and the Excelsior, were rated at 13½, while the Chalmette was rated at 12½.

With the exception of the Metropolitan and Morgan boats, built to carry freight exclusively, the prevailing and almost universal type of coaster, from the early '80s to well along in the '90s, was that seen in such ships as the Chattahoochee, of the Savannah Line, the Roanoke, of the Old Dominion, and the Alamo, of the Mallory. These boats had many minor differences in design, but were alike in the fundamental principle that they were built to compete with the railroads primarily in freight carrying, and used their passenger accom-



TUG ASTRAL, COASTWISE SERVICE OF STANDARD OIL CO.

modations as an accessory, without attempting to make fast time, as measured by the possibilities of the marine development of their time. There passenger rates were, in general, about the same as the flat railroad rates between the ports, but the rail passenger had, of course, to pay for meals and sleeping car accommodations in addition. It is worthy of note that these passenger boats were slower than the fast freighters above mentioned, the Chattahoochee being rated at 13½ knots, the Alamo at 13, and the Roanoke about the same. From the decadence of the early mail boats until 1889, the only 15-knot coasters were the City of Augusta, built for the Savannah Line at Chester, in 1880, and the City of Washington, of Alexandre's Cuba line, also built at Chester, in 1877.

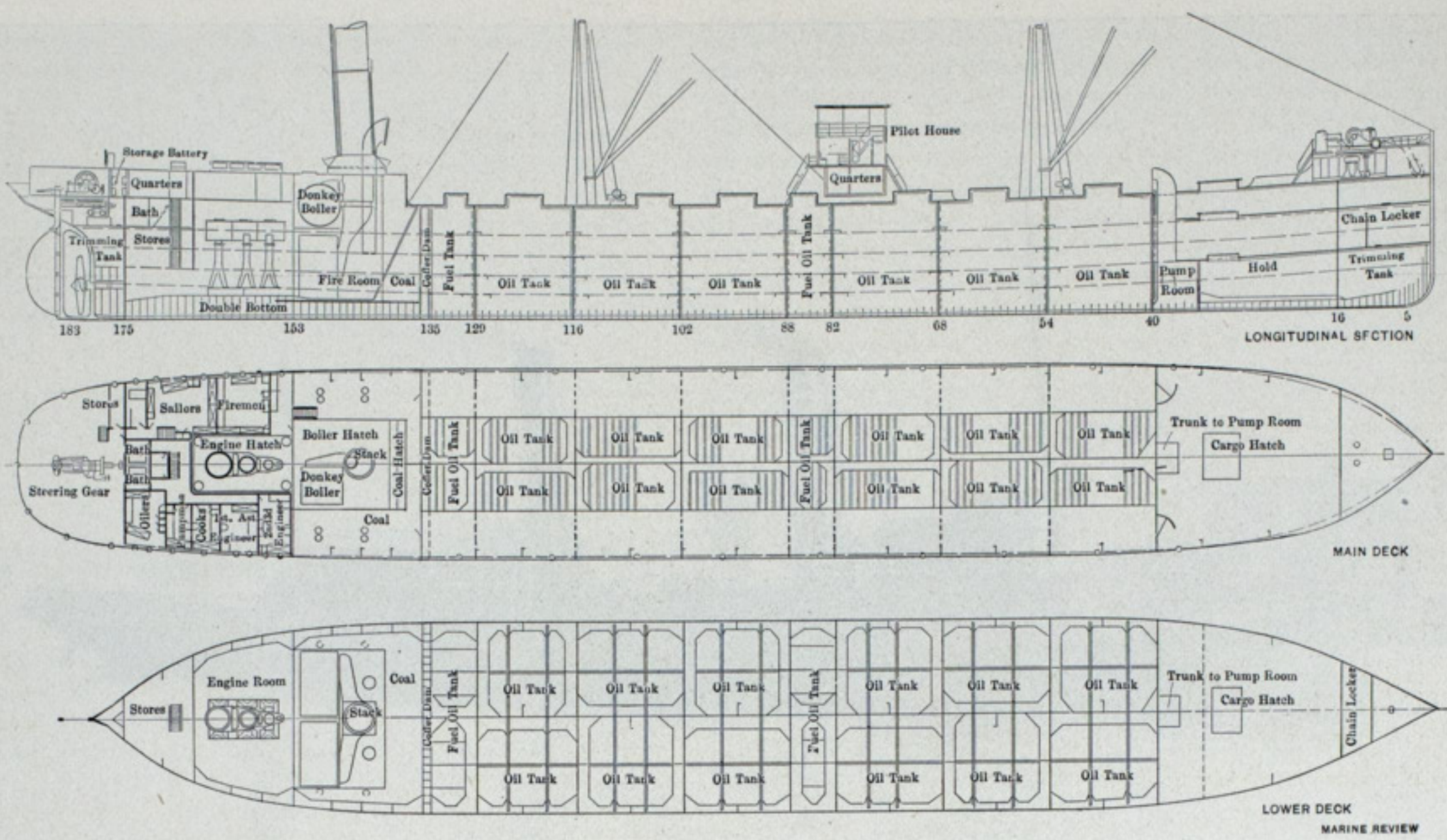
When the Savannah Line built the Kansas City, in 1889, as a 16-knot boat, they started an experiment in a higher speed passenger service which has since been followed by the Old Dominion Line, Maine Steamship Co., and other companies. As not being distinctively freight carriers, however, these faster passenger ships cannot be included in the present discussion, and it is interesting to note that before the Savannah Line ordered the City of Memphis, built in 1902, the directors divided on the question whether the new boat should be a fast passenger ship or an out-and-out freighter. The result was a compromise, and the vessel ordered was of large dead weight capacity, slow speed, and with limited passenger accommodations; an entire reversion from the type of the Kansas City. The flush deck and the 12½ knot speed of twenty-five years previous were used in connection with a gross tonnage of 5,252 and a dead weight carrying capacity of nearly 4,000 tons.

The City of Memphis, and the three other ships of the same general specifications which have since been added to the fleet (City of Macon, City of Columbus, City of Atlanta) represent the extreme of a principle now believed to be the sound one where competitive conditions warrant it: the sacrifice of speed to low coal consumption. The entire fleet of the Atlantic Transport Line, to cite a single instance, are examples of the same idea in the transatlantic service. The following table compares graphically the economical efficiency of the City of Memphis and the Kansas City, running as they do on a route where fast traffic can readily go by rail, and is hence outside the sphere of their competition.

	Built.	Gross tons.	Dead weight carrying capacity.	Speed, knots per hour.	Coal Consumption, tons per day.
City of Memphis ...	1902	5,252	4,000	12½	50
Kansas City	1889	3,679	1,900	16	70-75

In service, the Kansas City is generally run at a speed somewhat less than her maximum, say 15 knots, and burns 60 to 65 tons of coal per day.

The Clyde Line, running between New York and Charleston and Jacksonville; Boston and Charleston, Jacksonville and Brunswick; New York and Wilmington, etc., has had a somewhat similar history as regards sporadic efforts to start a fast service, followed by a decision to keep to moderate speeds and lessen coal consumption. Following the Cherokee, Seminole, Delaware, etc., which made no pretensions to speed, the Iroquois (1888) was designed to be a smarter ship, but was succeeded in turn by the Algonquin (1890), built to carry freight cheaply, rather than fast. The next large ship, the Comanche, built in 1895, was a 14½-knot vessel, as against 12 knots or under for the majority of the fleet. The Comanche and Iroquois were then lengthened, giving them a gross tonnage of 3,856 and 3,601, respectively, and in 1901 the Apache and Arapahoe, of 3,378 tons, gross, were built. These boats are about the same speed as the Comanche, but make it on smaller coal consumption. The newest ship of the line, the Huron, of 2,953 gross tons, is a freighter exclusively, and carries 2,700 tons dead weight at 12 knots on

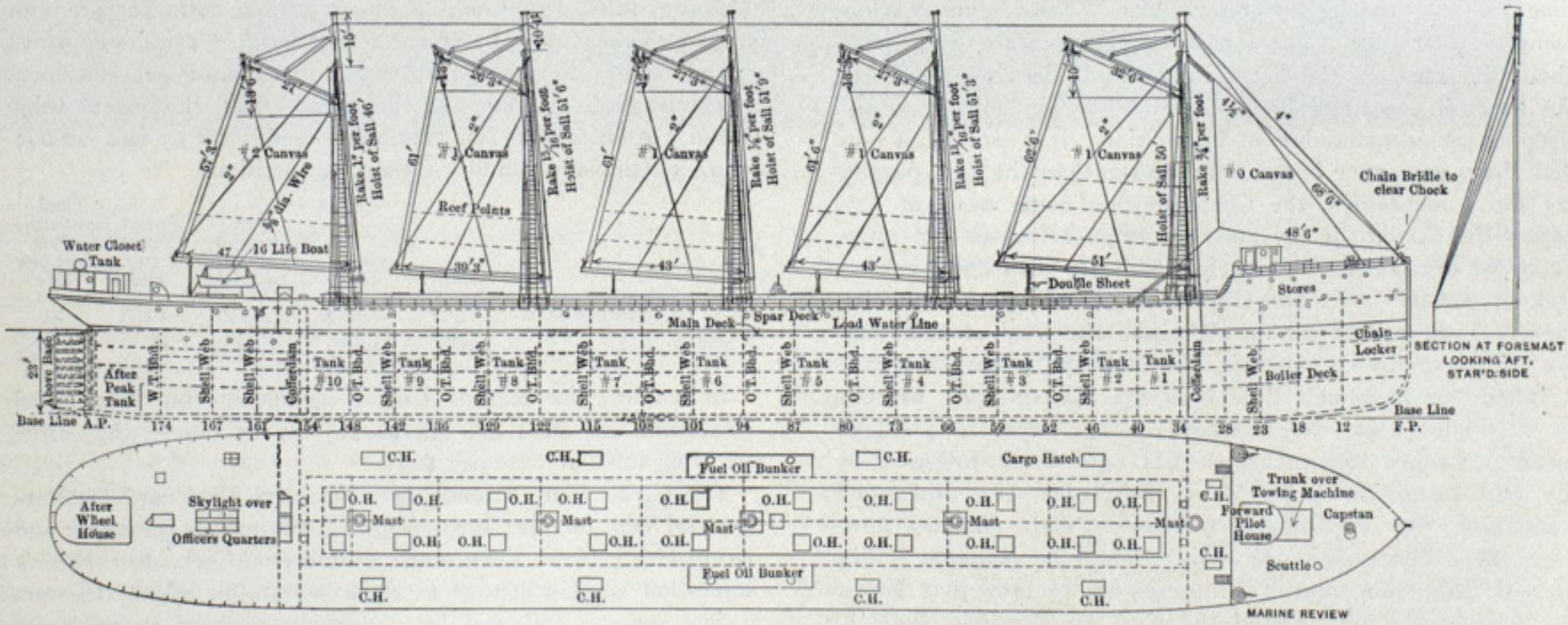


GENERAL ARRANGEMENT OF LONGITUDINAL SECTION, MAIN AND LOWER DECKS OF OIL TANK STEAMER FOR STANDARD OIL CO.

25 tons of coal per day. The Oneida, a steel boat of 1,324 gross tons built abroad and admitted to American registry, and the old Seminole are also worked as freighters at present, and the Carib, in the Wilmington service, is run primarily as a freight boat, although she carries a few passengers.

steamers of 1,100 tons, gross, built by Harlan & Hollingsworth in 1900.

It has always seemed surprising to the writer that the type of coastwise freighter so common in Great Britain—an iron single-screw vessel of about 1,000 tons, which "tramps it"



SAIL AND RIGGING PLAN OF OIL TANKER FOR STANDARD OIL CO.

The following table shows the comparative efficiency of the Apache, the Comanche and the Huron:

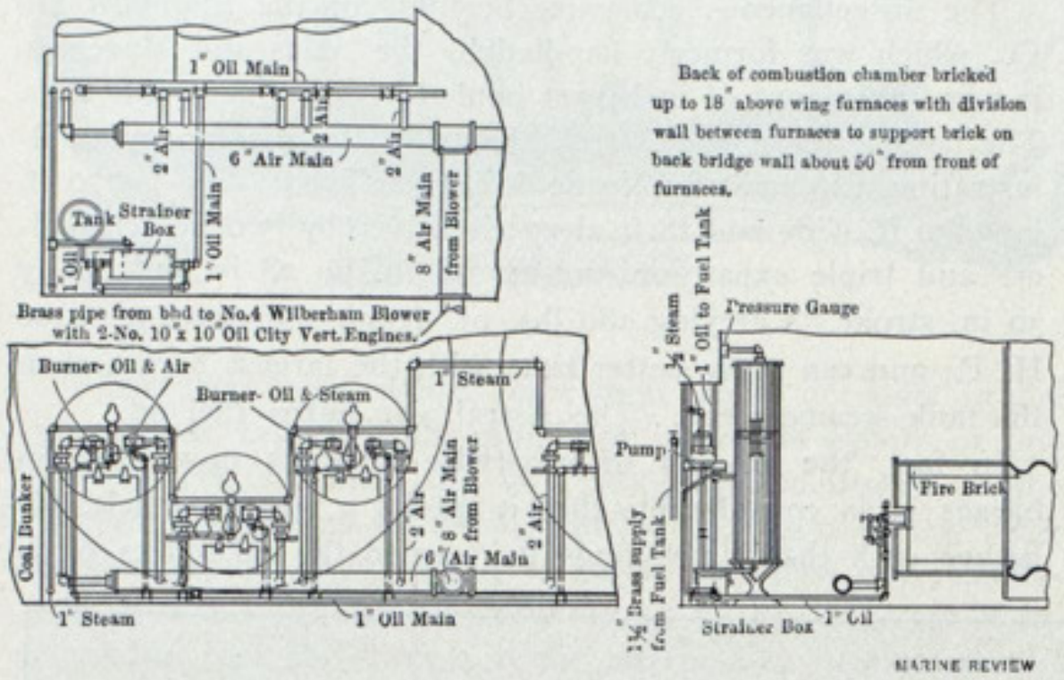
	Built.	D. W. carrying capacity.	Speed, knots.	Coal Cons. per day, tons.
Apache	1901	2,650	14½	55
Comanche	1895	2,500	14½	65
Huron	1903	2,700	12	25

Another noteworthy coastwise freight service of recent years is the line run by the New York & Baltimore Transportation Co. between the ports named. The two best boats on this service are the Chesapeake and the Manna Hata, steel

from Glasgow to Southampton and from the Bristol channel to the Tyne, should be almost wholly absent from the American coast. Our freight traffic has been almost invariably associated with passenger traffic, except on the two long-established, fast freight lines previously mentioned, the New York and Baltimore and New York and Philadelphia services, and in a few other sporadic instances, such as that of the steamship Dessoug, which the Savannah Line ran for some years as a freighter between Philadelphia and Savannah. Boats of the British tramp-freighter type as seen in the coastwise service, are built cheaply, to run cheaply, at low speeds, say 9 knots, and if they have to lie over a tide on a

mud bank, in a tidal harbor, they are none the worse for it. The higher cost of American ship building and of American crews apparently takes away the profit from an enterprise of this sort, and the schooner and barge fleets on the American coast take the place of the British tramp steamers as carriers of the lowest grades of freight on irregular charters. The Huron perhaps approximates this type of boat as closely as anything on the coast, although of higher speed and capacity, and at present engaged in regular service.

Contemporaneously with the attitude of the Charleston and Savannah lines in building slower boats, the freight line to



TYPE OF OIL BURNER USED BY STANDARD OIL CO.'S COASTWISE STEAMERS.

Boston and that to New Orleans and Galveston have been increasing the speed of their ships within the last few years. The Galveston and New Orleans lines can make considerably faster deliveries than can the railroads on everything except valuable express freight, which can afford to pay a high price by rail, and the Morgan Line, now worked by the Southern Pacific, takes all the eastern business of that company. Hence, to secure a share in the traffic to and from Galveston, the Mallory Line, carrying both freight and passengers, has been obliged to build such ships as the Denver and San Jacinto. The newest Morgan boats, El Valle, El Dia, El Siglo and El Alba, make better than 15 knots in service and are capable of 15½ or better. These vessels were built in 1901. The next class, El Cid, El Norte and El Rio, built in 1899, together with El Sud, built in 1898, are classed at 15½ knots. The El Valle class are of 4,605 gross tons; the others are approximately the same, except El Sud, 4,572. Since the establishment of the Newport News Ship Building & Dry Dock Co. at Newport News, Va., the Morgan Line vessels have all been built by that company.

The Metropolitan Line, running between ports which are connected by a rail service in which the fastest passenger trains run through in five hours, would seem to be placed where competition would be difficult, for the all-water route must round Cape Cod, adding to the distance, and must compete not only with the through freight service but with the Sound lines, to Fall River, Providence, etc., owned by the railroad, and making through connection to Boston over its lines. But the Metropolitan boats make the run in 20 hours, and as a general thing deliver freight several hours quicker than by the ordinary through rail service, while certain classes of bulky commodities, such as grain and coal, are often delayed several days in rail transit. The newest Metropolitan boat, the James S. Whitney, of 2,707 tons, gross, was built in 1900, and is a 16-knot boat, able to compete for all railroad through freight except certain perishable goods, the schedule for which is sometimes made as fast as 8 to 10 hours by rail. The James S. Whitney has triple expansion engines, the H. M. Whitney, Herman Winter and H. F. Dimock being fitted with compound engines. The following table compares these recent boats with two of the pioneers of the line, the Glaucus and Neptune, as regards tonnage, coal consumption and speed:

	Built	Gross tonnage	Approx. d w. cargo capa. tons:	Speed knots	Coal burned per round trip, 586 miles, tons:	Engine
Neptune	1864	1,848	750	..	53	Low Pr.
Glaucus	1864	1,848	750	..	51	Low Pr.
H. F. Dimock	1884	2,626	1,500	14	96	Comp.
Herman Winter	1886	2,626	1,500	14	86	Comp.
H. M. Whitney	1890	2,707	1,500	15	92	Comp.
J. S. Whitney	1900	2,707	1,500	16	105	Triple Ex.

The author has no figure for the speed of the Glaucus and Neptune, but it may be assumed at about 12 knots. The coal consumption is taken from the average of all trips for the year 1878, for the older boats, and 1903, for the newer. Thus the James S. Whitney burned very closely to the same amount of coal per ton of cargo as the Glaucus did, but got something like four knots better speed out of it, as a result of improvements in design.

Without doubt, the most interesting feature in the development of coastwise navigation during the past few years has been the growth of a fleet to handle the Texas oil traffic. For many years the Standard Oil Co. had worked the steamer Maverick as a sort of roustabout ship to carry bulk oil between coastwise ports in her own tanks or to tow oil barges, or both, as the occasion might demand. The Maverick was of 1,561 tons gross, built in 1890, and besides having capacity for 10,000 barrels (42 gal.) in her own hold, was full powered with 1,242 I. H. P., and was specially designed for heavy towing. A second ship, the Atlas, of 1,942 tons gross, 1,700 H. P. and capacity of 13,000 bbls. of oil, was built for similar service in 1899, while the Maverick, after being burned and sunk in Halifax harbor, was in a state of temporary retirement. The Maverick was subsequently raised, and the Bath Iron Works made a rather remarkable repair job of her, after which these two steamers continued in the service together, constituting the only tank vessels on the coast with their own motive power and under the American flag, at the time when it became necessary to find means of carrying the crude Texas oil to the refineries at New York.

Since 1902, every effort has been made by the Standard Oil Co., the J. M. Guffey Oil Co., the Sun Oil Co. and the Texas Co., to get together a fleet of tank vessels under the American flag, and the urgency, as well as the motive of economy, has occasioned the conversion to the trade of a number of foreign vessels and American vessels designed for other services. The oil fleet is at present made up as follows:

STANDARD OIL CO.

	Capacity, bbls.	Gross Tons.	History.
Col. E. L. Drake	38,000.	4,205.	Built for trade, 1903.
Barge 94	50,000.		
Lansing	40,000.		Ex Str. British Queen.
Barge 93	27,000.		
Atlas	13,000.	1,942.	Built for trade, 1899.
Barge 92	35,000.		
Maverick	10,000.	1,561.	Built for trade, 1890.
Barge 91	24,000.		
Barge 90	24,000.		
Northtown	22,000.	2,157.	Built at Chicago in 1901 to maintain a transatlantic service from that port. Unsuccessful. Converted by Northwestern S. S. Co. into tank ships. Chartered by S. O. Co.
Northman	22,000.	2,157.	
Northeastern	22,000.	2,157.	
Northwestern	22,000.	2,157.	
Julia Luckenbach	27,000.		Converted tramp steamers. Chartered from Lewis Luckenbach.
Harry Luckenbach	24,000.		
City of Everett	30,000.		Converted whaleback. Chartered. Rebuilding
Capt. A. F. Lucas	40.000.		Building by Trigg Co., Richmond
Barge 95	50,000.		Building

J. M. GUFFEY OIL CO.

	Capacity bbls.	
Winifred	20,000	From Great Lakes.
Ligonier	31,000	Built for trade.
Larimer	31.000.	Built for trade.
J. M. Guffey	20,000.	Ex M. S. Dollard, 4,000 tons. Converted by N. Y. S B. Co.
Catania	20 000	Ex Echuca 1,842 tons. Converted by Morse I. W.
Barge Conneaut	18,000	Gulf trade.
Barge Conemaugh	18 000	Gulf trade.

SUN OIL CO.

Paraguay	Formerly oil steamer on Great Lakes.
Toledo	Built for the trade.
Roma	Chartered from Michigan S. S. Co.
Washtenaw	From Pacific (Saginaw Steel S. S. Co.) Converted by Morse Iron Works.

TEXAS CO.

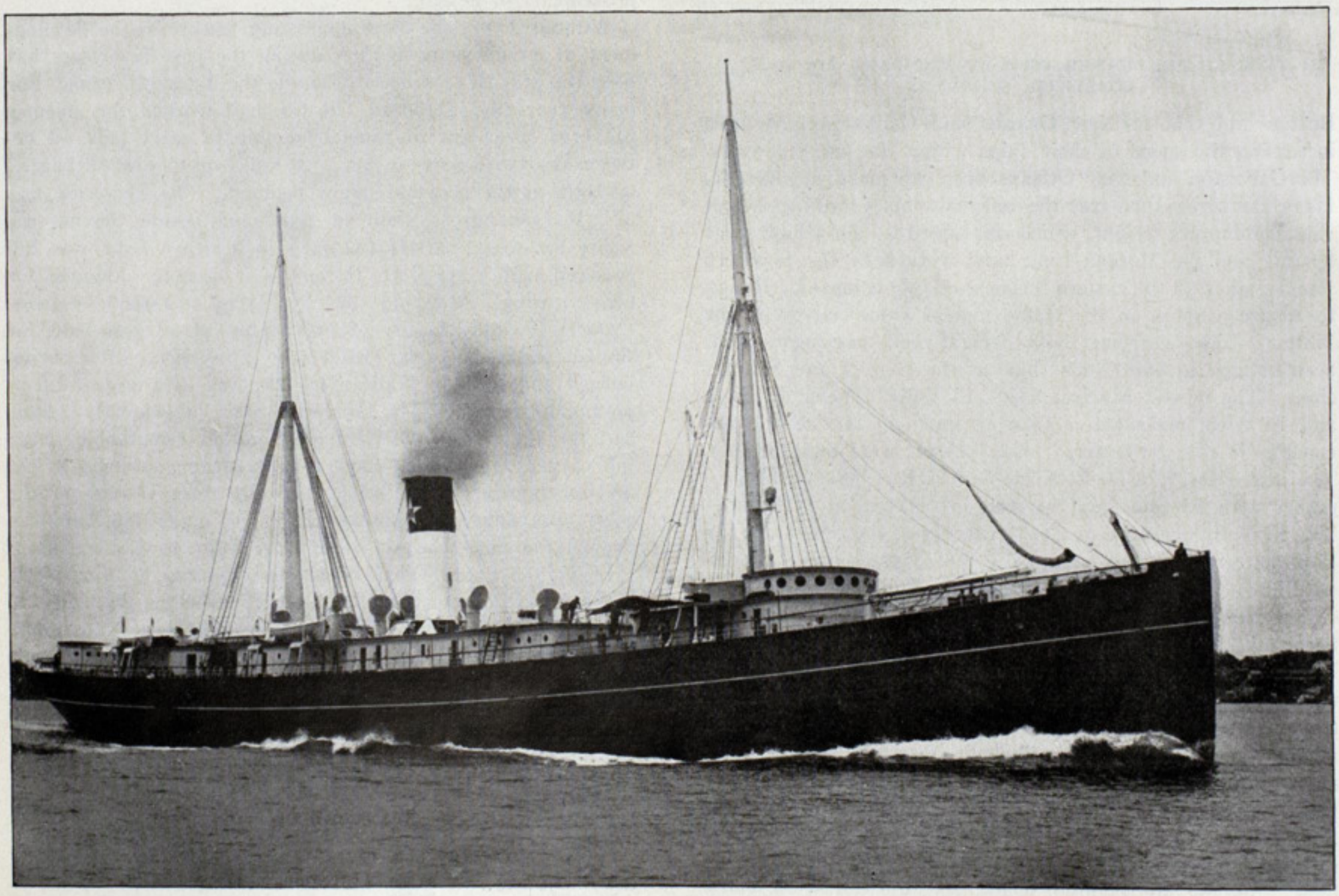
Florida	15,000 bbls. capacity. Converted by J. H. Dialogue.
Barge Providence	18 000 bbls. capacity.

These incomplete tables are designed to show, in a rough way, what has been accomplished in less than two years towards getting a fleet together. The Standard Oil Co. so far as possible works its boats in pairs, steamer and barge, and the new steel barges, known as the 94 and the 95, are suggestive in general appearance of the best of the ore barges on the great lakes. The accompanying drawings show how they are built, with a longitudinal compartment running the entire length of the vessel, on each side of the double row of oil tanks. The steamers are also provided with what is known as a cofferdam between the oil and the engines. This is a narrow tank extending clear across behind the oil space, and is designed to be filled with sea water as a protection and a telltale against leakage of oil.

The drawing of the Col. E. L. Drake shows the fuel oil tanks. All the Standard Oil boats in the Texas trade burn crude oil as fuel, and the consumption of the Drake, when towing her consort, is about 3,500 bbls. per round trip to Port Arthur, Tex., from New York; a trip of about 8 or 9 days each way for this ship, when towing. On the basis of five barrels of crude oil to a ton of coal, this amounts to 700 tons for the round trip, or approximately 39 tons a day. The oil consumption is figured at from 1.17 to 1.20 lbs. per H. P. per hour. Crude oil will cost, say 75c at Texas, and the freight on it to New York figures at 33c per bbl., so it is evident that oil burning is not at present to be considered by ships that do not make direct connection with the point of supply.

The miscellaneous coastwise business of the Standard Oil Co. which was formerly handled by the Atlas and Maverick, is now taken care of in barges hauled by some very able tugs. The best of these, the Astral, shown in the accompanying illustration, was built by Neafie & Levy in 1903. She is 170 ft. long, 30 ft. wide and 18 ft. deep; is driven by two Scotch boilers and triple expansion engines 18 in. by 28 in., 45 in. by 30 in. stroke. Carrying 180 lbs. of steam, she develops 1,100 H. P., and can make better time with the largest barges than the tank steamers can. The Astral also burns fuel oil.

In fact, the amount of coastwise business now done in barges is so considerable that it merits a special article, together with that which finds its way to the schooners or is found by them. But, on account of space limitations, the present paper must be confined to the ground already covered, treating exclusively of carriers under their own steam.



EL RIO OF THE MORGAN LINE.

[Built by the Newport News Ship Building & Dry Dock Co., Newport News, Va.

The giant freighter Augustus B. Wolvin took 10,300 tons of coal at Lorain last week and with this cargo drew 18 ft. 1¼ in. Her cubical capacity would enable her to take 3,000 tons more if the draught could be secured.

Recent Developments in Cargo and Intermediate Steamers.

By Edwin William De Rusett.

AUGUST BELMONT

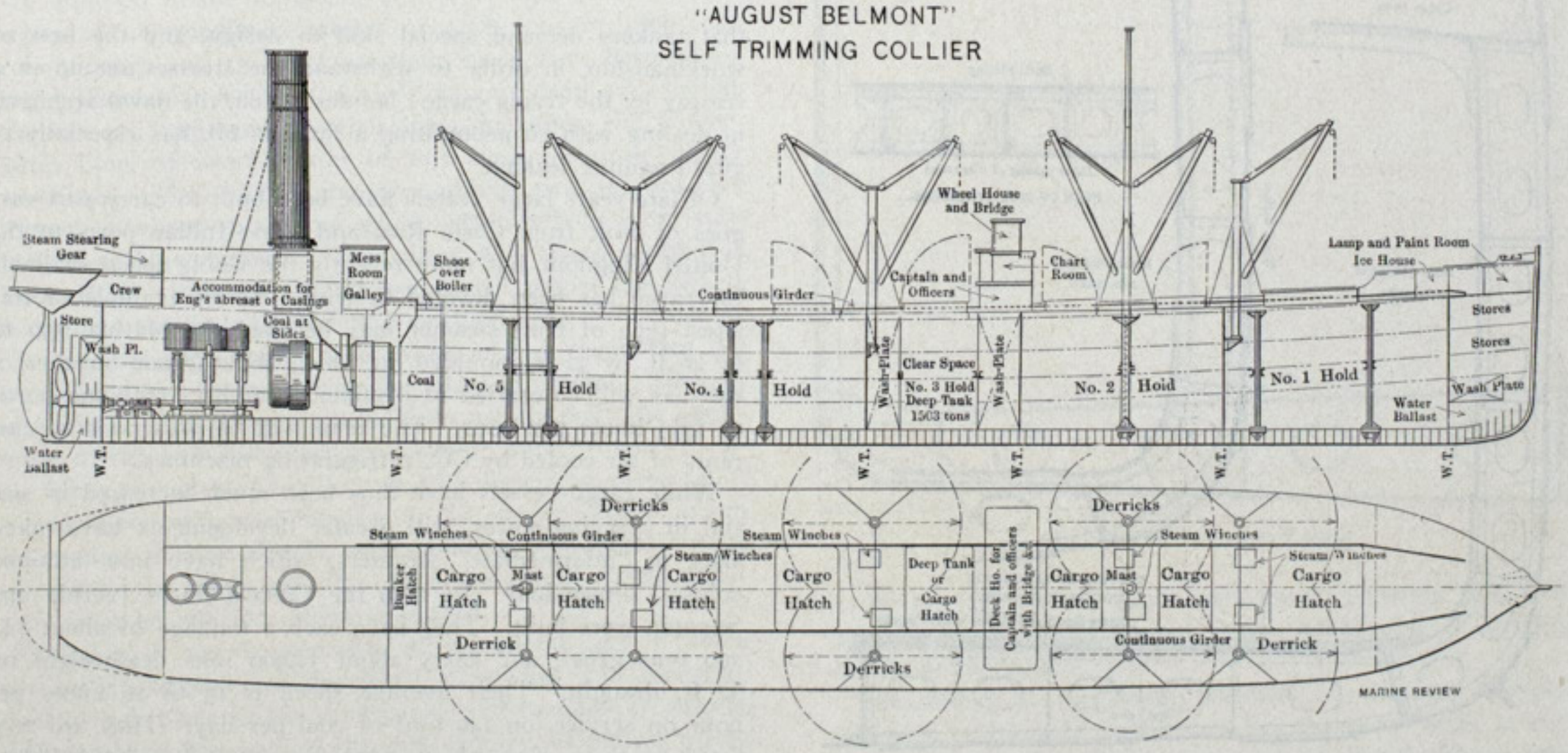
GRANGESBERG

Since 1899 rapid strides have been made, not only in the dimensions, capacity, and equipment of certain classes of cargo-steamers, but also, and in a more marked degree, in the "intermediate" class of vessel, which combines relatively large cargo-carrying capacity and extensive passenger accommodation with a capability of steaming 15 to 16 knots per hour. Such has been the success of the intermediate steamer that it is a question which will eventually become the more popular, this or the luxurious, speedier, and more costly liner of 20 knots per hour and upwards. At the outset the author would state that so much material has been placed at his disposal that it has been necessary to limit the examples referred to in these features distinct progress has been made during the past five years.

I. Type.

The "shelter-deck" type is still in favor for largest cargo and intermediate steamers, owing to the superior seaworthiness arising from large surplus buoyancy, and also on account of the covered-in shelters and relatively small registered tonnage. Development has taken place also in the design of the "single-deck" vessel, in which there is but one deck, with holds clear, or practically clear, of beams and pillars; and the size of such vessels has been increased. This arrangement is

Fig. 1
"AUGUST BELMONT"
SELF TRIMMING COLLIER



llustration of the subject, mainly to those with which he is personally acquainted. Though this course may be not altogether free from disadvantages, yet, on the other hand, opportunity will be afforded to others for bringing forward examples drawn from their experience.

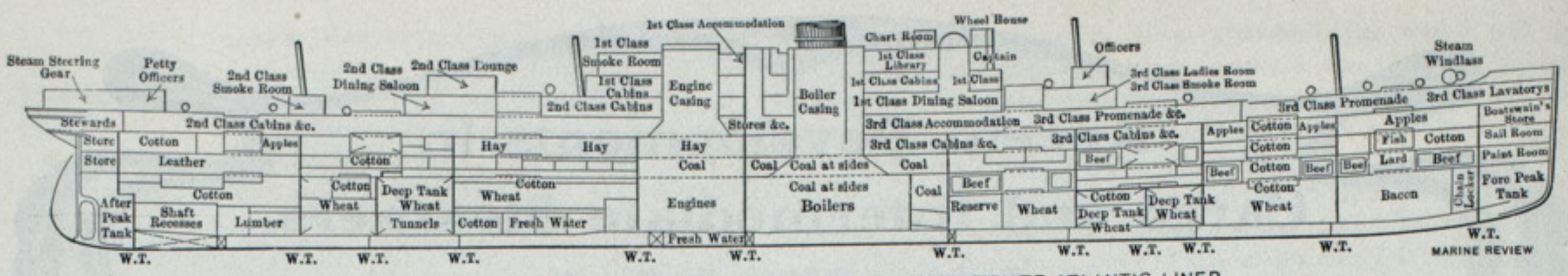
In order to facilitate comparison, it is proposed to deal with the subject under the same heads as in the author's Conference Note, namely:

I. type; II. size; III. construction; IV. capacity; V. cargo appliances; VI. ballasting; VII. economy of working. In all

Paper prepared for British Institution of Civil Engineers.

specially suitable for the carriage of cargoes such as coal, timber, grain, ores, etc., which can bear superincumbent weight. So skilfully have these structures been designed, that beams and pillars have been entirely dispensed with in the holds of steamers of up to 5,000 tons dead-weight; while in each of the midship holds of the largest vessels of this class, carrying upwards of 10,000 tons, only two beams, connected to web frames and supported by wing pillars and deck-girders, have been found to be necessary for giving the structure due strength, with the addition of a bulkhead.

As an example of recent "single-deckers," apart from turret



PROFILE ILLUSTRATING METHOD OF LOADING AN INTERMEDIATE ATLANTIC LINER.

vessels, having neither hold-beams nor pillars, may be cited the Margherita, built in 1900, with a moulded depth of 18 ft. 5 in., and of about 5,000 tons deadweight; also of vessels of the same type, with a minimum number of hold-beams and pillars, may be mentioned the Catalone, built in 1901, having a molded depth of 30 ft. 1 in., and of 6,000 tons dead-weight, and the August Belmont, 30 ft. 6 in. in molded depth, and of about 7,000 tons dead-weight. The latter vessel, built by Messrs. Swan & Hunter in 1902, was at the time the largest of her class; though similar vessels were designed in that year to carry as much as 12,000 tons dead-weight on a draught of 27 ft. 6 in. The construction plans were passed by the British Corporation, but the vessels were not built, owing to commercial considerations. The turret-steamer Grangesberg, built in 1903 by Messrs. Wm. Doxford & Sons, is the largest single-decker in existence. She is 440 ft. in length, 62 ft. in beam, and 29 ft. deep in the hold, and is reputed to carry about 10,-

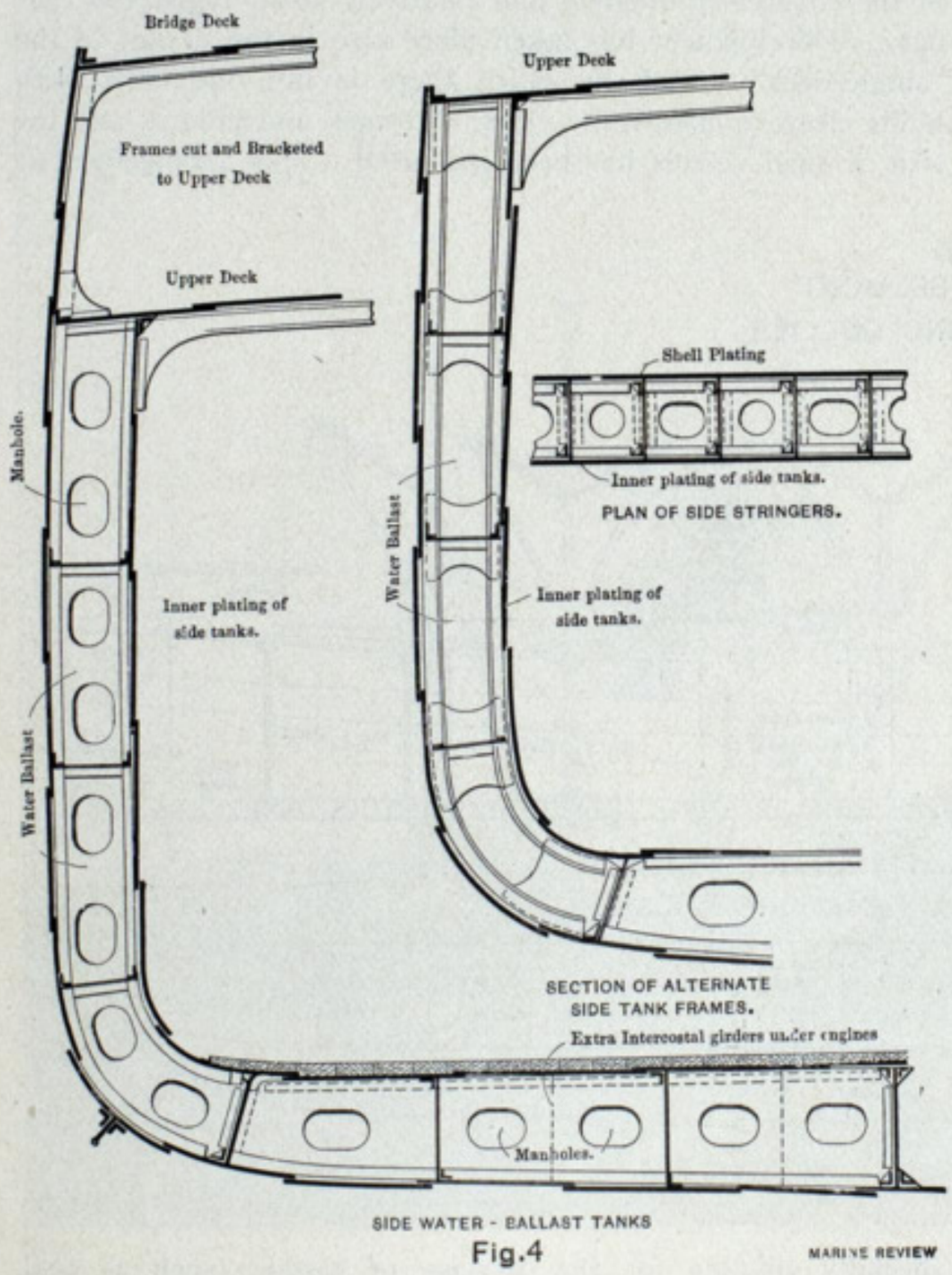
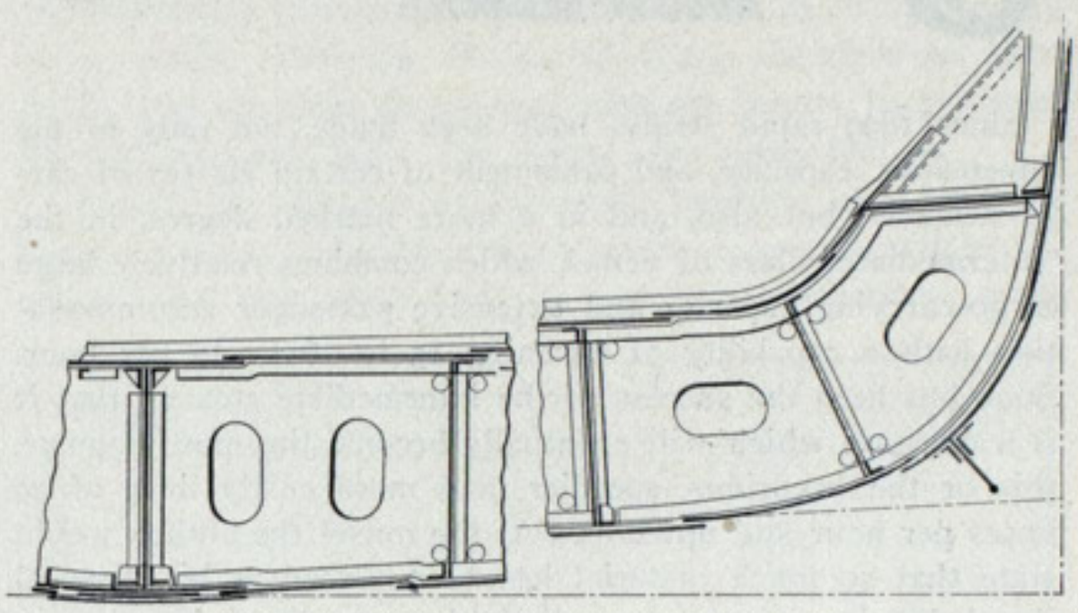


Fig.4

000 tons of ore on the light draught of 22 ft. 6 in. It is difficult to foresee what size may yet be reached in vessels having but one deck.

Vessels specially constructed for carrying oil in bulk have advanced in size even more rapidly than those of the foregoing types. In 1899 oil steamers carrying 6,000 tons were considered large; but the Spondilus, Pectan, Silverlip and Goldmouth, built in 1903, carry each about 9,500 tons of oil in bulk, and 1,000 tons of either oil or coal for fuel. The Narragansett, however, also built in 1903, bears the palm. She is 512 ft. long, 63 ft. 4 in. in beam and 34 ft. 6 in deep, and carries 11,0000 tons of oil, and 1,500 tons of either oil or coal fuel. These vessels are also designed for carrying general cargoes, and are fitted with all necessary appliances for this purpose. As they are divided into numerous compartments by oil-tight bulkheads and trunks, they are probably the safest vessels afloat, being practically unsinkable. It need hardly be said



TRANSVERSE SECTION SHOWING DOUBLE BOTTOM EXTENDED TO LOWER HOLD STRINGER FOR WATER-BALLAST.

Fig.3 MARINE REVIEW

that tankers demand special skill in design, and the best of workmanship, in order to withstand the stresses set up in a seaway by the trying cargo; besides which, the naval architect, in dealing with so penetrating a fluid as oil, has especially to guard against leakage.

Of late years large vessels have been built to carry part cargoes of fruit from Costa Rica and West Indian ports to the United Kingdom, but more recently the whole space available for cargo has been devoted to fruit. As an example of this latest type of fruit steamer may be cited the Matina, 350 ft. by 46 ft. by 32 ft. moulded, in which about 46,000 bunches of bananas will be carried in insulated chambers to home ports, at 12½ knots per hour. The fruit will be preserved by currents of air cooled by CO_2 refrigerating machines.

While cargo-vessels have thus been much increased in size and in carrying-power, still greater developments have taken place in "intermediate" steamers, which have now attained colossal dimensions. In 1899 the Cunard liners Ivernia and Saxonia were built. They have each a tonnage of about 14,-200 tons gross, and carry about 12,900 tons deadweight on 32 ft. draught. Their average speed is 15 to 16 knots per hour on service, on 140 tons of coal per day. They are now fitted so as to carry about 2,500 first, second and third-class passengers, and have actually carried at one time a total of 2,347 besides a crew of about 300 all told. The fact that since the Ivernia, the Saxonia, and the later steamer Carpathia of 13,600 tons gross, commenced running, the passenger accommodation has been gradually increased, indicates the public appreciation of these comfortable steamers. Further, since they were in commission, the White Star Suevic, of 12,500 tons gross, has been built, carrying nearly 450 passengers, besides 12,000 tons of cargo, and coal sufficient for the whole voyage to Australia via the Cape, at 13 knots per hour. She has been followed by other vessels of the same class and of

still larger tonnage, dimensions and capacity, culminating in the Celtic and Cedric, each of over 20,000 tons gross tonnage; and quite recently the Baltic, of 24,000 tons gross—the largest vessel ever built—has been launched and will soon be equipped. Her capacity for measurement cargo will be about 28,000

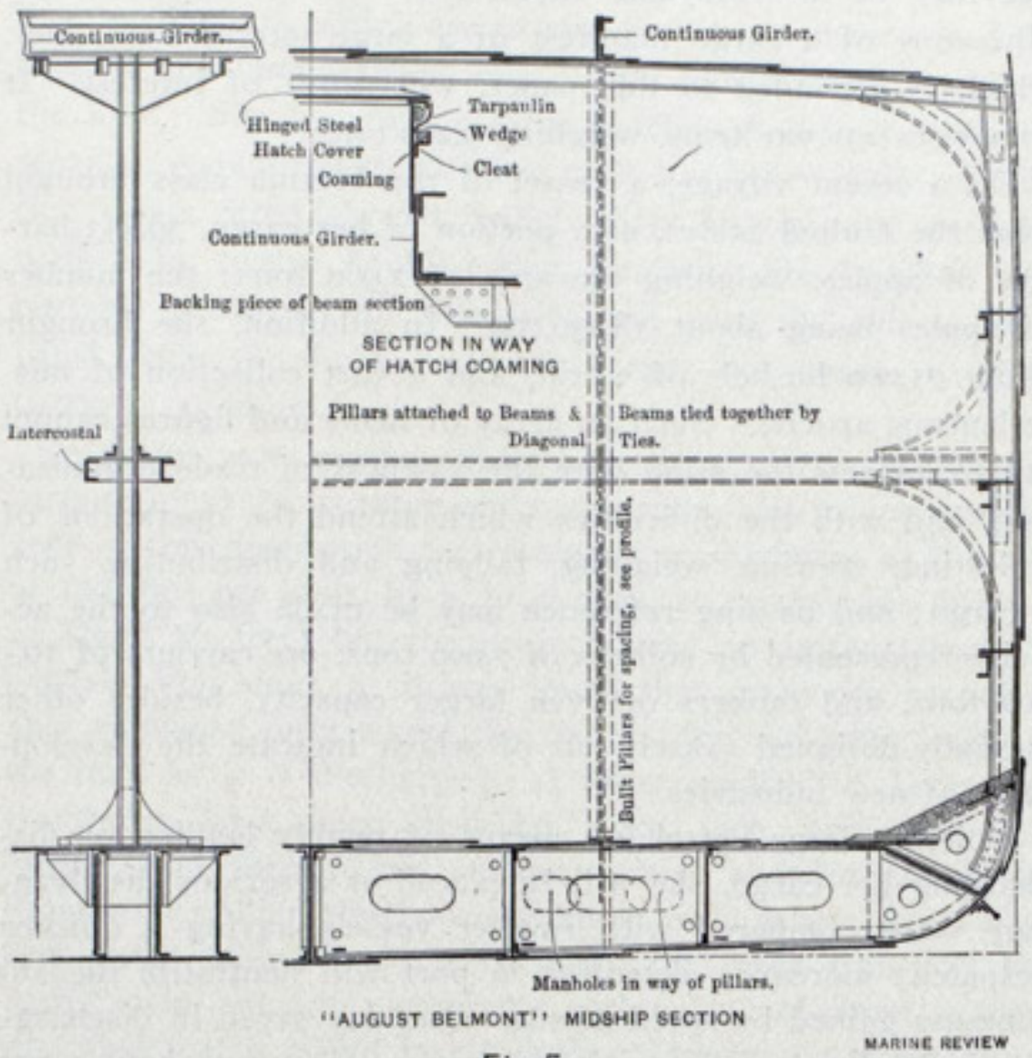


Fig.5

tons. She will accommodate nearly 3,000 passengers, besides having space for a crew of about 350. All these vessels have twin screws and balanced engines.

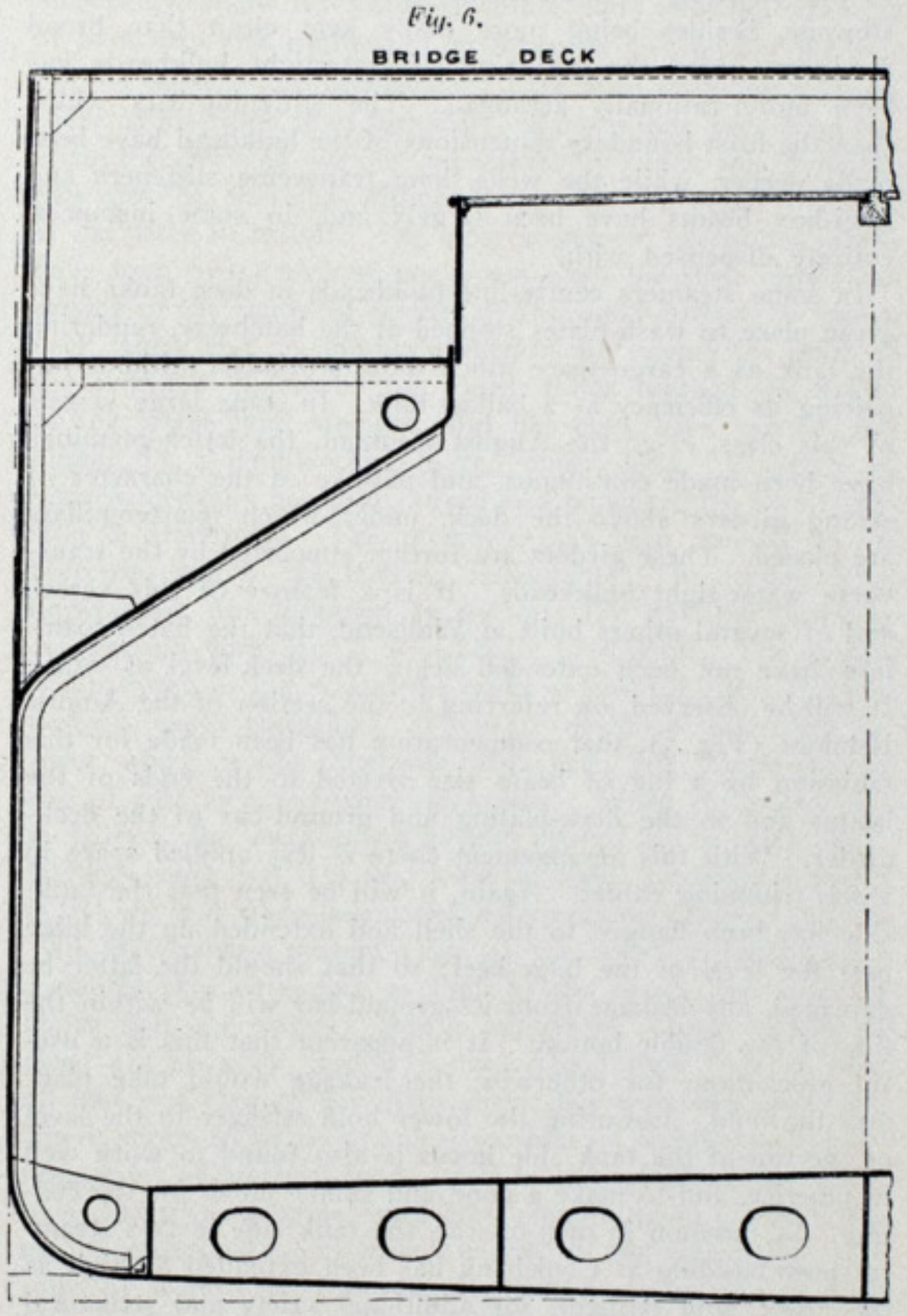
In addition to the foregoing typical vessels, numerous examples of intermediate steamers of 4,000 tons to 4,600 tons gross tonnage and 13 knots per hour speed have been added to the Peninsular & Oriental Co.'s famous fleet, and similar steamers are employed in other lines, including the Union-Castle Line, of which vessel of this class constitute nearly two-thirds. The Allan Line are adding two intermediate steamers of about 12,000 tons gross, which will be fitted with Parsons turbine-engines. The boilers will afford steam for 11,000 H. P., which it is anticipated will propel the vessels at 17 knots per hour in moderate weather.

It has long been known as a matter of experience that the larger the vessel the more economically and profitably she can be worked. But there are conditions which limit the application of this principle, such as depth of water in port, docking facilities, means of collecting and dispersing cargo, etc.; so that, along with vast increase in the size of vessels and in the number of large vessels, corresponding developments must proceed in the landward side of the question. These, however, must be left for others to record.

Generally, it may be said that, during all the ages in which mercantile shipping has flourished, only slow and moderate growth took place in the dimensions and tonnage of vessels, until after the first half of the past century—doubtless owing mainly to the fact that wood was the material of which they were built; but in this age of steel, and notably since 1890, the building of combined cargo and passenger vessels, of dimensions originally applied only to high-class passenger steamers, has arisen, and has been rapidly developed. Whereas about fifteen years ago a cargo-steamer 300 ft. long and of 2,600 tons gross was considered to be fairly large, and one 400 ft. in length and of 4,500 tons gross was looked upon as exceptionally large, such vessels have now reached nearly 520 ft. in length and 9,200 tons gross, and between 12,000 tons and 13,000 tons dead-weight; while a combined cargo and passenger steamer (the Baltic) is being built whose length exceeds 700 ft. and gross tonnage 24,000 tons. There seems to be no reasonable limit to extension, so far as the shipbuilder is concerned; but probably the limits of draught of water will be a determining factor in the problem.

Before leaving this division of the subject, particular attention is directed to that part of the statement which recounts the recent rapid growth of the ship building industry in the United States of America. The record is phenomenal; for before the year 1900, with the exception of the St. Louis and St. Paul, not a single vessel 470 ft. long had been launched from American yards, whereas since then no less than eighteen vessels have been built exceeding this length, having a gross tonnage of 158,100 tons, and an average of 8,780 tons. The largest American-built vessel, the Mongolia, is 600 ft. by 65

Fig. 6.



High Wing Ballast-Tanks.

ft. by 51.2 ft., and of 13,300 tons gross: showing that well-equipped yards in the United States are capable of building vessels of the largest size.

The output of very large steamers in Germany deserves comment. Although the number has decreased from 12 to 8 or by 33 per cent., and the gross tonnage has decreased from 136,000 tons to 107,000 tons, or by 21 per cent., the average size has increased from 11,340 tons to 13,380 tons, or by 18 per cent. The largest German vessel, the splendid liner Kaiser Wilhelm II., built in 1902, exceeds the Kaiser Wilhelm der Grosse, built in 1897, by 5,000 tons—a highly creditable performance.

So far as the author has been able to ascertain, France has built only two vessels of a length exceeding 470 ft. The larger of these is La Savoie, a fine steamer, 563 ft. long by 60 ft. beam, measuring about 11,900 tons. Therefore, although

later in the field than Germany, the United States have become the principal competitors of England in the ship building industry.

III. Construction.

Although but few novelties have been introduced in the construction of steam-vessels since 1899, many of the features which were introduced before that date continue in vogue. Flanging internal work, such as tops of floors, bulkhead-stiffeners, casings and deckhouse-plating, is becoming more general. Joggling of frame-bottoms, and, in some instances, of the frame-legs, has been extensively adopted in lieu of joggling the shell, resulting in a manifest improvement in the appearance of the ship, besides increasing the displacement. Girder-framing finds increased favor, as it lends itself to the adoption of hold-stringers, which cause less broken stowage, besides being more easily kept clean than broad stringers. Also the stiffening of watertight bulkheads has been more rationally arranged. The stiffening-bars which span the least boundary dimensions of the bulkhead have been made deeper, while the webs, long transverse stiffeners and semi-box beams have been largely and, in some instances, entirely dispensed with.

In some steamers centre-line bulkheads in deep tanks have given place to wash-plates stopped at the hatchway, rendering the tank as a cargo-space much more workable, without impairing its efficiency as a ballast-tank. In some large vessels of this class, *e. g.*, the August Belmont, the hatch-coamings have been made continuous, and partake of the character of strong girders above the deck, under which quarter-pillars are placed. These girders are further supported by the transverse water-tight bulkheads. It is a feature of this vessel, and of several others built at Wallsend, that the hatch-coamings have not been extended below the deck-level as usual. It will be observed, on referring to the section of the August Belmont (Fig. 5), that compensation has been made for this omission by a lug of beam size riveted to the ends of the beams and to the deck-plating and ground-bar of the deck-girder. With this arrangement there is less unfilled space in a self-trimming collier. Again, it will be seen that the tank-side has been flanged to the shell and extended up the bilge past the level of the bilge-keel; so that should the latter be damaged, any leakage from its ground-bar will be within the line of the double bottom. It is apparent that this is a useful precaution, for otherwise the leakage would take place into the hold. Lowering the lower hold stringer to the level of the top of the tank side knees is also found to work well in practice, and to make a good and simple finish for the ceiling. As common in men-of-war, the tank side in two steamers now building at Clydebank has been extended as high as the lower hold stringer, for additional safety and structural purposes, and in order to provide more space for water-ballast. Several minor improvements have also taken place, but to dwell upon them would render this paper too lengthy.

IV. Capacity.

The immense capacity of the modern steamer for both measurements and dead-weight cargo indicates the vast strides which have been made in commerce, especially in later years, when vessels have grown in size with marvellous rapidity. For example, the intermediate steamers Cymric, Ivernia and Saxonia have a dead-weight capacity of about 12,200 tons, and a measurement capacity of about 20,000 tons at 40 cu. ft. per ton. Fig. 2 will convey some idea of the labor needed to fill a steamer of this capacity. It shows a vessel laden with a mixed homeward cargo, composed of 187,200 items and weighing 8,360 tons; it illustrates the skill with which such vessels are stowed, with the object of not only filling the holds, but in filling them in such a way that the vessel may be easy in her movements at sea. It is scarcely necessary to say that this latter point is of considerable importance, especially to passengers, of which these intermediate vessels carry large numbers. In fact, such steamers are so remarkably free from rolling and pitching that a North Atlantic voyage may be an enjoyable experience, even to a bad sailor. The copy of a cargo manifest of a large intermediate liner, which is appended to this paper, will prove of interest. It comprises 231,300 items, weighing 9,260 tons.

On a recent voyage, a vessel of the Ivernia class brought from the United States, as a portion of her cargo, 39,433 barrels of apples, weighing upwards of 2,960 tons; the number of apples being about 18,250,000. In addition, she brought about 71,000 bushels of wheat, and a vast collection of miscellaneous articles. Such an array of items and figures cannot fail to impress the mind with the vastness of trade organization, and with the difficulties which attend the operations of collecting, stowing, weighing, tallying and distributing such a cargo; and passing reference may be made also to the activity represented by colliers of 7,000 tons, ore-carriers of 10,000 tons, and tankers of even larger capacity, besides other specially-designed vessels, all of which indicate the development of new industries.

Unless a large vessel has means of readily loading or discharging her cargo, she will be placed at a serious disadvantage when compared with smaller vessels having a quicker despatch; moreover, detention in port will neutralize the advantages gained by speed at sea. One day saved in discharging or loading a fully-employed tramp will mean about 1 per cent. of her capital cost; it is therefore natural that cargo-appliances are receiving increased attention. The winches have been multiplied, their speed has been increased, and now they often run for hours without being stopped or reversed. Manilla and small flexible steel-wire runners are generally employed for light lifts; derricks are more numerous; hatches are wider; and frequently two hatchways are provided in each hold.

It may be useful to turn again to the diagram of the August Belmont as an example of a modern cargo-steamer. It will be seen that the cargo is worked by sixteen derricks, which swing from ten vertical deck-posts, and land the cargo 13 to 16 ft. over the side. All these can be raised or lowered by tackles so as to vary the reach. There are nine hatchways, four of the holds having two each; they are 14 ft. to 17 ft. long by 21 ft. wide. The holds are very free from obstructions, and with this object the engines are placed right aft. The cargo-hatch covers are of steel, and are hinged to the coamings. They are made weather-tight by a simple method devised by the author. There are no hatch-beams to be removed or replaced, as the covers are so strong that these otherwise necessary hindrances have been dispensed with; consequently all the hatches can be uncovered in 20 minutes, and can be closed and secured in an equally short time.

The Mystic, a collier of similar design, by the same builders, carrying 6,000 tons dead-weight and steaming 11 knots per hour on a voyage of 545 miles each way, made thirty-two voyages in 1901 in 9 months 18 days, steaming 44,756 miles. In 1902 she made thirty-six voyages in 11 months 19 days, and steamed 55,929 miles, loading and discharging in 1901 187,200 tons, and in 1902 210,600 tons of coal. Her average cargo was about 5,850 tons, besides her bunkers. These figures will give an idea of the heavy wear and tear such ships are subjected to, as each voyage means pumping out and filling nearly 2,600 tons of water-ballast, raising and lowering hinged hatches at least twice, mooring and unmooring at terminal ports, towing to and from the ship, etc.; besides working the engines ahead and astern, going alongside at each jetty, and usually anchoring once or twice per voyage. The balance of

time was occupied in reaching her station in 1901, and in dry docking, etc. The two sister ships, Catalone and Mira, do equally good work. All three vessels are loaded and discharged by shore appliances.

With the "turret" class of vessel have been introduced startling innovations, which are exemplified in an unsurpassed degree in the Grangesberg, one of the most recent vessels of the kind. She has twelve large hatchways, which work six separate compartments for ore, and has seven pairs of derrick masts fitted abreast, which carry twenty-four derricks, worked by twelve double-ended winches. She is fitted with portable platforms for delivering ore over the side as it is lifted from the holds, and discharges her cargo of about 10,000 in 35 hours.

In recent years strong efforts have been made to work coal-cargoes by grabs working on transporters, and in one instance gear of this description was designed to discharge at the rate of 100 tons per hour, by a 3-ton grab, at an overside distance of about 16 feet; but the project went no farther than the experimental stage, as it was found that grabs can be profitably employed only where the coal is dry and runs freely in the hold as it is discharged. A large number of Temperley transports have been installed since 1899, principally for British and foreign government service and for shore use, though the collier Mercedes and about eight other vessels have been fitted with them. It is stated that each transport can easily make one trip per minute with a load of about 25 cwt., provided that it is fed fast enough. The author is not aware that grabs have been used with this gear. No doubt transporters possess an advantage in being able to reach overside to any reasonable distance, even up to 40 ft. or more. The discharging is accomplished by an automatic carriage or traveller, which is adapted to carry the load, and to run up and down an inclined I-shaped steel beam placed athwartships, and supported by guys of an ordinary cargo-derrick. The system is so well known that it needs no further description. It is admirably suited where circumstances require the cargo to be discharged at an unusual distance over the side; but normal requirements are met by the ordinary gear, for, with vessels having suitable cargo-arrangements, 500 to 600 tons of coal can be shipped per hour from railway trucks. As an instance of the rapid discharge of mixed cargo may be recorded that of the Milwaukee, which delivered 11,000 tons dead-weight in 66 hours working-time.

Ships' appliances can now load and discharge cargo faster than it can be supplied to the vessel or taken away. Grain can be elevated into and out of steamers; oil can be pumped both in and out; coal can be tipped in, and taken out by bucket or grab. In fact, it is seldom that general cargo can be accumulated rapidly enough to serve a large modern steamer, except in the case of liners which have fixed sailing days, full or empty. The main difficulty in getting good despatch in loading is that the cargo is frequently not to hand. Delay in discharging occurs on account of want of sufficient space for delivered cargo, and because the customs of certain foreign ports allow the consignee to take delivery in the leisurely way of the sailing-ship days. Further, in the case of overside delivery, each parcel of cargo has to be sorted on the deck before it can be delivered to the lighter or coaster alongside. All this shows that at present the up-to-date steamer is ahead of the shore arrangements.

Electric lighting for vessels has become universal; but although electricity is usefully employed in shipyards for hauling and lifting, it has not yet found general acceptance in steamers for working the cargo. Cost appears to be its chief drawback. Cannot electricians produce a noiseless electric winch, at a cost not exceeding that of a steam-winch, and deriving its power from a good compound engine, which will tempt owners of cargo-vessels to adopt it in place of the present winch equipment, with its inconvenient pipe-service and multitude of non-expansive engines, wasteful of steam and costly in upkeep? Of course the steam-engine and dynamos would have to be of a reliable character, for, should they fail, the whole installation would be rendered useless; but such a fear should not have too much weight, as hydraulic cargo-gear depends also upon a single steam-engine. Economy of steam would certainly result.

VI. Ballasting.

As vessels more frequently than ever make half their passages in ballast and bunkers only, it has been found necessary to increase the proportion of water-ballast in order to give sufficient draught for steady steaming, thus reducing straining of both ship and engines. Consequently, methods of increasing the capacity for water-ballast have been receiving a larger share of attention than formerly. Many minds have been exercised in devising various expedients by which this desirable end may be obtained without rendering the vessel too stiff at sea when in ballast. The most prominent inventions which have been introduced of late years have for their object the raising of the centre of gravity of the water-ballast, by 'tween deck tanks, and, in another direction, by raising the wing of the ordinary double bottom, until it has reached the height of the lower hold stringer, and has even been carried still higher, by a double skin, to the upper deck. A system of high wing-tanks has been introduced concurrently by Livingston & Harroway. The invention has been applied to the Mercedes and to the Hedwig Heidmann. The former, it is understood, was designed by the late Sir Raylton Dixon in conjunction with Mr. J. R. Christie of Cardiff. The system is illustrated in Fig. 6, and the tanks extend for about half the vessel's length amidships. They are designed to occupy the space which would otherwise have been left vacant by the run of coal in a self-trimming collier. When the vessel was in ballast, the metacentric height proved to be very satisfactory, being 3 ft. 1½ in.; when in light condition it was 9 ft. 1½ in., and when laden with homogeneous cargo, 2 ft. 6 in.

In McGlashan's system (Fig. 4) the water is contained in a double skin extending as high as the upper deck and for about half the vessel's length amidships. Nine vessels so fitted are at work, and it is understood they have realized all that was claimed for them when they were first proposed. There seems to be no practical increase of weight, as the arrangement of material lends itself to strengthening the structure; but there is some extra cost, amounting to about £1 per ton of additional water-ballast carried in the side tanks. The ratio of water-ballast to displacement is about 20 per cent. The system adopted by Messrs. Swan & Hunter in 1898, and since more extensively by Messrs. Osbourne, Graham & Co., that of 'tween deck tanks, has been fitted in three vessels, the Milwaukee, the Hercules and the Boscombe. There is some increase of scantling with this arrangement, which, of course, will vary according to the amount of water-ballast. In the vessels last mentioned it amounts to about 30 tons. The cost, however, appears to be somewhat less than that of building deep tanks. The ratio of water-ballast to load displacement in these vessels is about 17½ per cent. The Cunard intermediate steamer Caronia, now building at Clydebank, has her double bottom carried up to the lower hold stringer Figs. 3), with the result that there has been an increase of about 35 per cent. above the normal capacity of double-bottom tanks, and the center of gravity of the water-ballast has been raised nearly 1 ft. This will have the effect of easing the vessel when in ballast. Deep tanks in addition to the double bottom is the arrangement more generally adopted; but for vessels making short passages and carrying mixed cargo this

plan is objectionable on account of broken stowage, caused by the heavy stiffening and longitudinal sub-division, and the alternate wetting and drying of the deep tank, which is apt to be detrimental to the cargo.

Of very recent years one or more vessels have been built by Messrs. Sir James Laing & Sons, and five by Messrs. Swan & Hunter, in which the longitudinal center-line bulkhead in way of the hatchway has been omitted; and this in tanks having a depth of 27 ft. and holding 1,400 to 1,500 tons of water. Such omission of a portion of the bulkhead considerably facilitates the handling of cargo. A tank of this immense capacity may be filled or emptied in about 5 hours by a centrifugal pump. As the engines and coal are placed aft in the vessel referred to, the deep tank is placed about amidships. Such a tank is arranged in the August Belmont (Fig. 1), in which the ratio of water-ballast to load displacement is 28 per cent. In large vessels having deep tanks, with the engines amidships, it has been found advisable to place the deep tanks well apart, say, one between the fore and main holds, and the other dividing the two after holds. As the result of stress-calculations made for vessels about 470 ft. long, when in ballast conditions and fully bunkered, it has been found that this disposition of weights reduces the stress on the top members of the girder by about 20 per cent. when the vessel is in the hollow of a wave 470 ft. long and 23 ft. high.

In vessels fitted with deep tanks and a double bottom, the ratio of water-ballast to load displacement varies considerably; in some vessels built by Messrs. Swan & Hunter it is as high as 30 per cent, giving admirable results at sea.

Space will not permit of dwelling further upon this interesting subject, otherwise pumping appliances might have been referred to. The importance of these details is greatly enhanced in vessels having so high a relative capacity for water-ballast, as the ballast has frequently to be discharged in a very short time.

VII. Economy of Working.

The ease with which large vessels are propelled, and the speed obtained with full models, are remarkable. Experience has proved that well-designed vessels of full form can be driven on a remarkably low consumption of fuel. For instance, the Ivernia and Saxonia steam about 15½ knots per hour on 140 tons per day, with about 20,500 tons mean displacement. The Carpathia, a similar but smaller vessel, steams 15 knots per hour on 115 tons per day, on a mean displacement of about 19,000 tons. The Monarch, a cargo vessel built by Messrs. Swan & Hunter, lifting about 11,600 tons when loaded, steamed at an average speed of 11.35 knots per hour on two North Atlantic voyages, on a coal consumption of less than 48 tons per day; the outward voyage was in ballast and bunkers, and on the homeward voyage the vessel was fully laden. The cost of conveying ordinary cargo in a liner from the United Kingdom to the Port of Bombay is about 25*s*. per ton weight, including dock-dues, loading, discharging, depreciation and maintenance of steamer, and Suez canal dues. This figure applies to goods sent alongside in lighters. If the vessel were loaded from a wharf, the gross cost would amount to about 30s. per ton. Considering that the distance is about 6,400 miles, the cost per ton-mile, based on a 30s. rate, would average about 0.05d. and in a tramp carrying coal or grain, much less. Comparing this with the average cost of transport by goods- or mineral-train in this country, including loading, unloading and conveyance, which amounts to 1.54d. per ton per geographical mile, or about thirty-five times as much as ocean transport, some idea may be formed of the economy of the latter; but it must be remembered that it costs nothing to make the road at sea, whereas the railway companies are burdened with the cost of thousands of pounds per mile for their permanent way and its maintenance, besides rates and taxes, etc. Still, the railways may possibly find it advantageous to increase the size of their transporting plant, as the ship owner has increased his.

THE OLD WITCH OF THE WATER.

The old tug Witch of the West is, with the exception of the old gunboat Michigan, probably the oldest craft on fresh water. Fifty years ago this year the keel of the Witch was laid at Petitt's island, N. Y., and at the same time there was laid the keel of a sister craft, which was christened the Stanton. The latter has long since disappeared but the Witch is still doing business. She was first employed on the Atlantic coast and from there was taken to Buffalo where she engaged in the general business of towing. Later she was sent to Toledo. About thirty years ago she was sold to Mosher & Green of Bay City, Mich., where she has been continuously since though her ownership has changed several times. She was last purchased by Capt. William Gordon of Bay City, who died about two years ago. The Witch is now owned by his widow, Mrs. Mary Gordon, of Bay City.

It is reasonable to suppose that many of the timbers that were placed in the hull of the Witch fifty years ago have been replaced from time to time with others. A ship is like a lady's watch, always out of repair, and there is always a lot of work necessary to be done on a tug after she has been doing hard duty for even a single season. The engine in the Witch was built by Neafie & Levy of Philadelphia, is 16 by 17 cylinder, and of peculiar design compared with the tug boat engines of the present day. On the frame there are hangers for rock shafts to drive a feed pump, also a bilge pump, and in the frame are many bolt holes apparently placed there for the purpose of affording the inquisitive an opportunity to ask questions. They have been there so long that those who might have explained their utility are dead and forgotten, and no one living pretends to know what particular purpose they served. The engine has worn out three boilers and the fourth one is now in use.

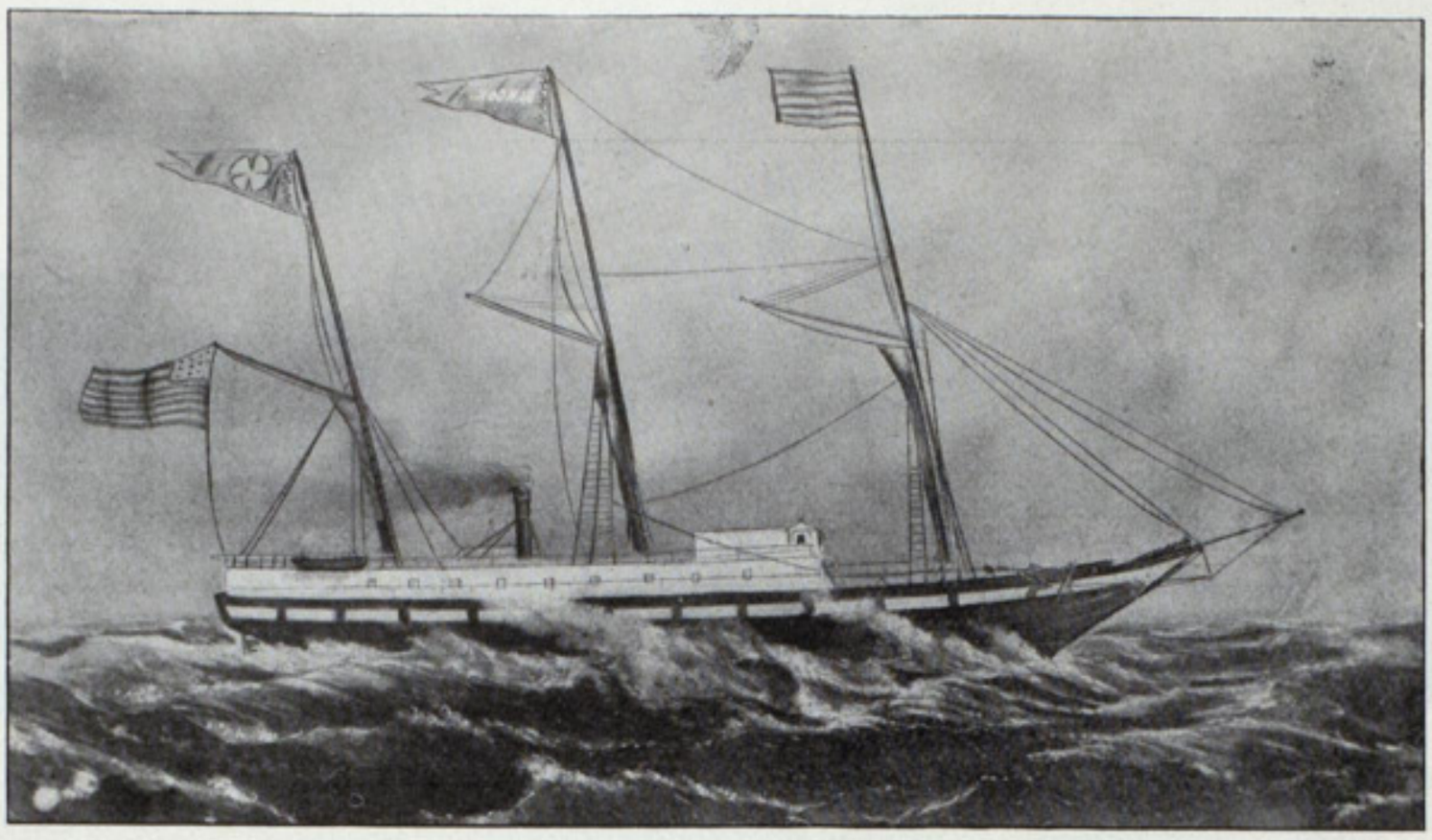
The service of the Witch has not always been that of merely puffing and pulling away at the end of a tow line. Many and many a dark and stormy night in the fall of the year the Witch has hugged the lee side of the north shore of Saginaw bay or lurked in the vicinity of the Charities waiting for a tow, with the big swells rolling over her decks. And the Witch has worn out a lot of men. Those who were children when her keel was laid are now gray haired, and those who trod her decks forty and fifty years ago have mostly, if not all, gone.

General Manager Peabody of the Alaska Steamship Co., Seattle, Wash., announced last week that oil would replace coal as fuel on the company's fleet of steamers, including the Dolphin, Jefferson, Rosalie and Whatcom. The decision to change the fuel for steaming purposes was reached after witnessing the successful trial trip of the Northern Commercial Co.'s steamer Saidie, recently equipped to burn oil. According to the records kept it required a little more than a barrel of oil to keep the vessel's engines in operation for an hour at a cost of $1.20. During the trial trip the Saidie maintained a speed of 11 knots an hour. It is understood that arrangements have been made to install oil burners in the Sound steamers England, Flyer and Athlon. It will cost about $25,000 to make the change in the Alaska Steamship Co.'s steamers.

The new twin screw steam yacht Warrior, which is now nearing completion at Troon, Scotland, for Frederic R. Vanderbilt, has just been put through her official speed trials. She is 239 ft. long, 3 2ft. 6 in. beam and 19 ft. molded depth. She attained a speed of 15.7 knots on her trial.

BANGOR, SATURN AND PATHFINDER.

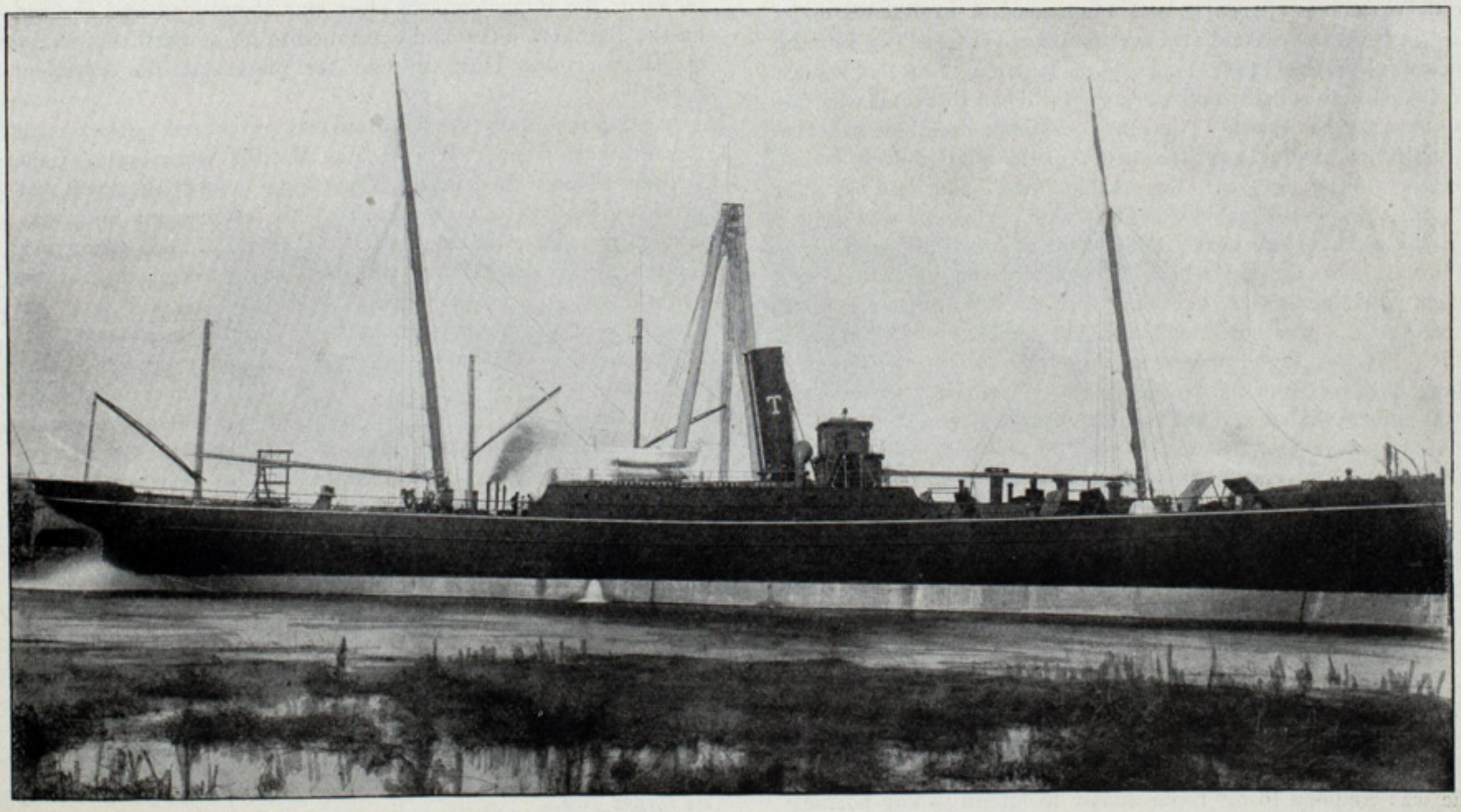
In the accompanying article appear the pictures of three freight steamers, all built by the Harlan & Hollingsworth Co., Wilmington, Del., and showing the evolution of the freight carrier. These steamers are the Bangor, Saturn and Pathfinder. The Bangor was built in 1843, the Saturn was built in 1890, to be used as a collier or general cargo carrier. She was later sold to the government and is now used as a collier. The Pathfinder was built in 1901 and is an example of an up-to-date cargo carrier. The Bangor was built for the Bangor Steam Navigation Co. She was laid down in October, 1843 and was completed in June, 1844. She was 131 ft. long on deck, 120 ft. between perpendiculars, 23 ft. beam molded and 9 ft. depth of hold from base line amidships. She was schooner-rigged with bow sprit and jibboom, having three wooden masts and carrying a suit of eight sails. She was equipped with independent, twin-screw propeller engines with cylinders 22 in. diameter by 24 in. stroke. The propeller wheels were 8 ft. 6 in. diameter of the Loper type. Her boiler was 20 ft. long and of a type known as the drop-flue boiler. Her builders' trial trip took place on the Delaware river in 1844 from the navy yard, Philadelphia to Fort Mufflin, a distance of 16 miles against the tide going down and with the tide going up. Her average speed for the down trip was 10.61 miles per hour and the average speed of her up trip 14.07 miles per hour. The steam pressure was under 46 lbs. during the whole trip. On the down trip the first 5 miles were run with low steam, making 44 revolutions.



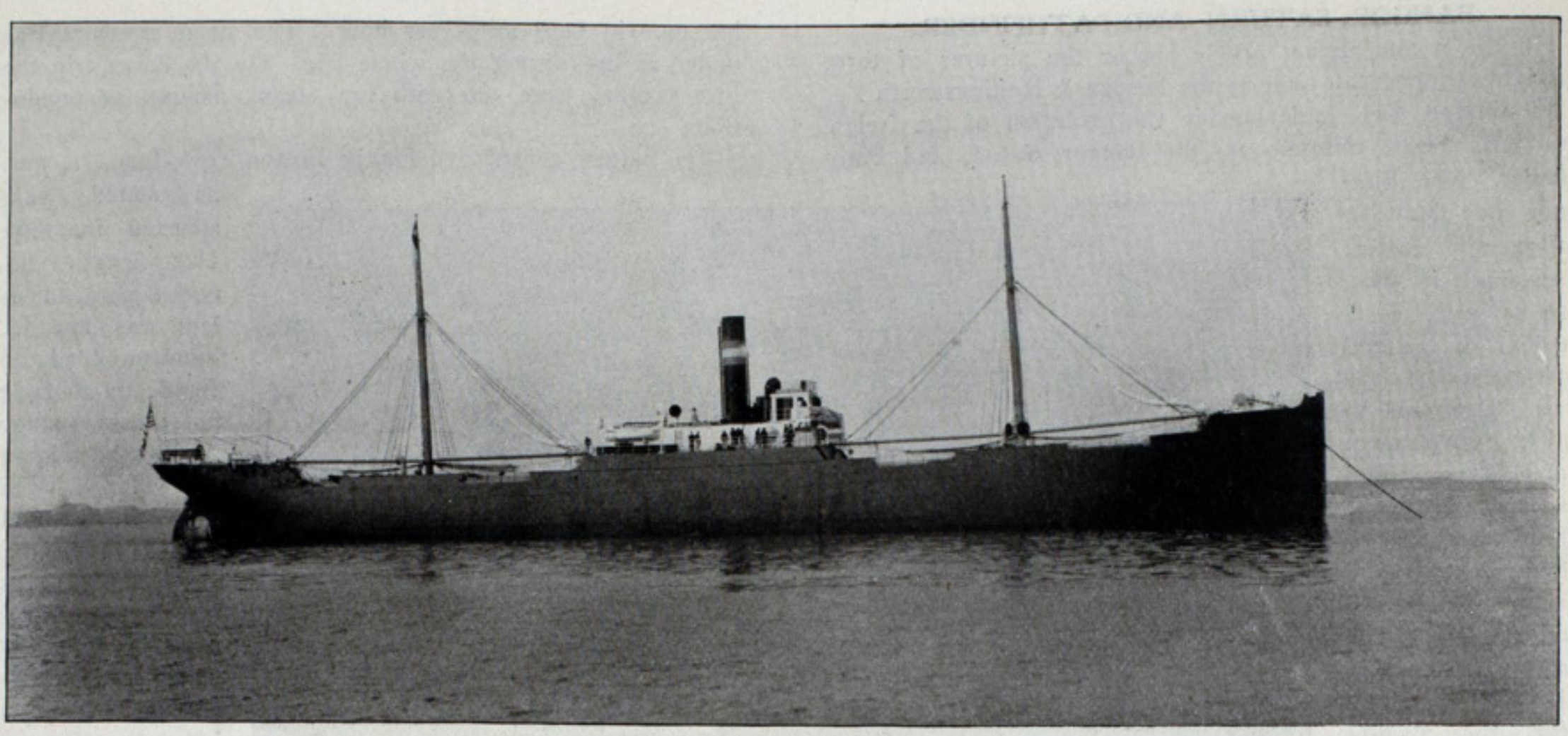
BANGOR, FIRST IRON SEA-GOING PROPELLER STEAMER IN THE UNITED STATES.
[*Built by the Harlan & Hollingsworth Co., Wilmington, Del.*

The Saturn, constructed for the Boston Tow Boat Co., was, as stated, constructed in 1890. Her length between perpendiculars was 275 ft., beam molded 40 ft., depth 26 ft. 2 in., gross tonnage 2,268. She was an iron ship with a capacity of hold of 2,964 tons and a deadweight carrying capacity of 3,047 tons. Her engine was triple expansion with cylinder diameters of 24, 39 and 59 inches by stroke of 48 in. Her propeller was 14 ft. diameter by 21 ft. 6 in. pitch. Steam was supplied by four Scotch boilers 11 ft. 3 in. diameters by 11 ft. 9 in. long, allowed a working pressure of 155 lbs. She had also a donkey boiler 6 ft. 6 in. diameters by 9 ft. 4 in. long. Her indicated horse power was 1,526 and she made 12 knots towing two barges at 67 revolutions.

The Pathfinder, built for H. T. Knowlton and H. A. Carver, is 320 ft. over all, 310 ft. between perpendiculars, 44 ft. 11 in. beam molded, and 23 ft. depth. Her gross tonnage is 2,792. Her engine is triple-expansion, 23, 38 and 62 in. cylinder diameters by 42 in. stroke, equipped with steam from two Scotch boilers 15 ft. diameter by 10 ft. 6 in. long, allowed a pressure of 172 lbs. per square inch. Her propellers are



THE SATURN, BUILT IN 1890 FOR THE BOSTON TOW BOAT CO.
[*Built by the Harlan & Hollingsworth Co., Wilmington, Del.*



PATHFINDER, AN EXAMPLE OF A MODERN OCEAN FREIGHT CARRIER.

[*Built by the Harlan & Hollingsworth Co., Wilmington, Del.*

15 ft. 6 in. diameters by 15 ft. 6 in. pitch. She displaced 5,918 tons at 19 ft. 3 in. below the waterline. Her dead-weight carrying capacity is 4,060 tons and her speed 11 knots. She is classed 100A in Lloyds under the single deck type.

OLDEST STEAMSHIP COMPANY.

As far as can be discovered the oldest steamboat company in the United States in point of continuous service is the Weems Steamboat Co. of Baltimore, which has since 1817 been continuously owned and managed by descendents of the founders. In 1817, ten years after Fulton had succeeded in propelling a boat on the Hudson by steam power, the Weems Line was established by George Weems, who chartered the steamer Surprise to run between Baltimore, the Patuxent river and landings on the Chesapeake bay. She continued to run until 1821 when the Eagle was bought. This steamer was built in one of the eastern ports and came around to Baltimore by sea, it being the second steamer that ever ventured out into the ocean. She was 130 ft. long and 22 ft. wide. She had a mast forward with sails, which were spread when the wind was fair to increase her speed. There was no upper deck, but in warm weather an awning was stretched over the quarter-deck, which, in the fall of the year, was taken down. She had no pilot house. The ladies' cabin was fitted with berths and was located in the stern of the boat. Between it and the engine was the dining room, around which were berths on which the men slept when meals were not being served. When these steamers were built it was not known that the engine could be made to back. It was found necessary, therefore, to stop the engine a long distance from the landing point. Sometimes the distance was miscalculated and the steamer crashed against the wharf with violent force. The people used to assemble in large numbers on the wharves to see the boat approach and frequently the old captain would stand out on the bow and warn them to get out of the way, that the boat was coming and could not be stopped in time to prevent an accident. It would work backward as well as forward. Another difficulty was the absence of bells on the boat—no way of communicating with the engineer except by calling him.

The Eagle continued to run until 1824 when her boiler exploded while she was lying in the harbor at Annapolis. By this accident Capt. Weems not only lost almost everything that he had but was himself so seriously hurt that for a long time he was confined to his room unable to attend to any business. This accident caused the death of one of the passengers, who was the only passenger ever killed and with one exception the only one injured since the line was established.

Having recovered from his injury, Capt. Weems organized a company which built the Patuxent in 1827. This steamer was regarded at that time as a floating palace—far superior to anything that had been seen in these waters. In his newspaper advertisement of the schedule the captain said that "a first rate cook and active, obliging attendants had been selected with great caution by him, and he hoped by these attractions and by his unremitting attention, aided by a sumptuous table, to merit and obtain for the boat a full share of public patronage."

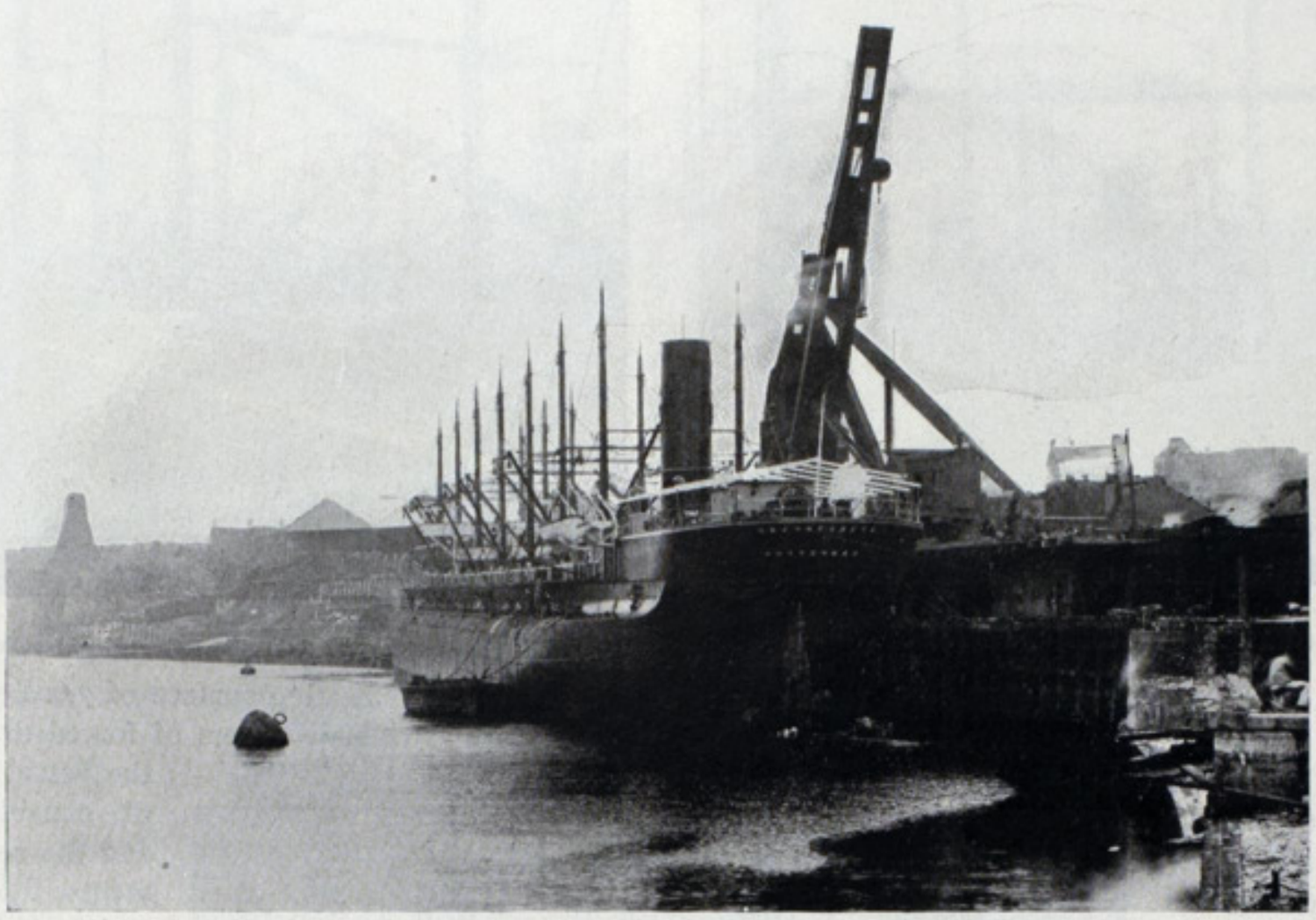
In 1828 the Patuxent started to run to Fredericksburg and landings on the Rappahannock river, calling on her way at Herring bay and landings on the lower part of the Patuxent river. For some time she continued to run this route, but afterwards the Rappahannock river was abandoned and she ran on the Patuxent alone and continued to do so until 1845, when the Planter was built to take her place and the Patuxent sold.

In 1854 the Mary Washington was purchased. Afterwards the steamers George Weems and Matilda were built. Capt. George Weems died in 1853, but long before his death had given up the entire management of his boats to his four sons, who were engaged as engineers and captains upon them until the war broke out in 1861, when the boats were seized by the government and used as transports. After the war was over the route to the Rappahannock river and Fredericksburg was resumed. The last surviving brother was Mason L. Weems, the oldest one, who died in 1874, at which time the present management took charge. The fleet now consists of ten steamers which ply between Baltimore, the Potomac, the Rappahannock and the Patuxent rivers, and also between Norfolk and the Rappahannock.

The German naval department have been experimenting at Dantzic with the view of ascertaining the relation of depth of water to speed. Torpedo boats were used for the purpose. Up to 12 knots depth exercised no influence on speed, but from 15 to 20 knots obstruction increased in shallow water proportionately as speed diminished. At about two fathoms depth, about twice as much engine power was required as in deep water. The experiments are to be repeated with ships of larger size.

GRANGESBERG, ORE CARRIER.

As a later-day type of bulk cargo carrier the Grangesberg, designed and built by William Doxford & Sons, Sunderland, England, for W. H. Muller & Co., Rotterdam, for the Baltic ore trade, is certainly distinctive. Her radical difference from the type of ore carrier on the great lakes lies in the fact that she carries her discharging gear with her, and the accompanying photographs will show what a complicated mass of equipment is carried on her deck. On the lakes, of course, the discharging apparatus is a part of the dock equipment, and the deck of the ore carrier is absolutely unencumbered. The deck of the lake ore carrier is an uninterrupted succession of hatches from machinery to pilot house, and in the case of the Augustus B. Wolvin, the largest carrier on fresh water, there are thirty-three of them, spaced 12 ft. centers. The Grangesberg is designed to carry 10,000 tons of ore on a draught of 22½ ft. The Wolvin has had no chance as yet to carry ore, but her initial cargo of coal is 10,300 tons on a draught of 18 ft. 1¼ in. Coal is measured in net tons and ore in gross, so that the Wolvin's initial cargo, translated into gross tons, would be 9,151.



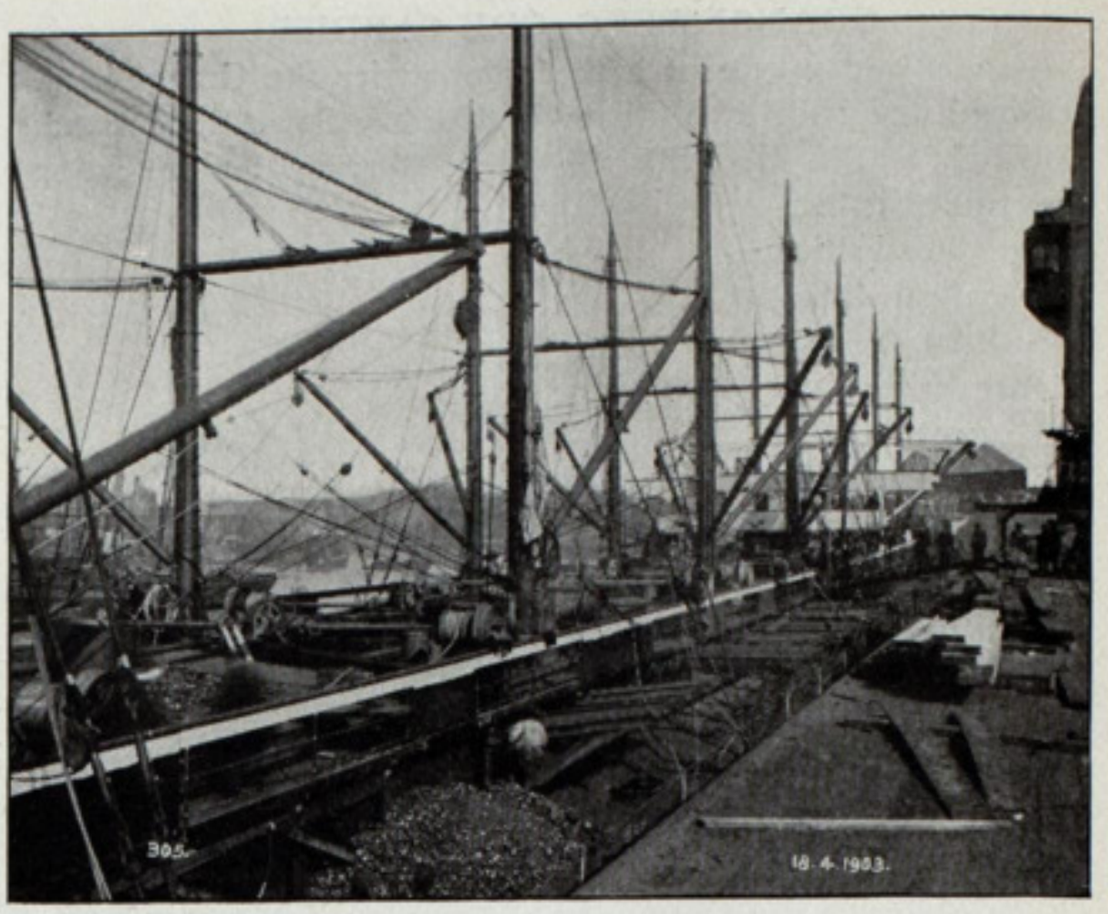
STERN VIEW OF THE GRANGESBERG.

The Grangesberg is an unusual vessel in every way. Her cargo of 10,000 tons is said to be the largest ever attempted on the Baltic in a draught of 22½ ft. The difficulties surrounding her design were enhanced by the fact that the length of the vessel is limited by pier accommodations at loading station and the height of the vessel above water is limited by the loading chutes. As in the case of lake vessels the greatest advantage of length is obtained by designing the vessel with the machinery aft, which enables her to be placed with only the loading portion of the vessel abreast of the piers. These limitations resulted in the Grangesberg being designed 440 ft. long between perpendiculars, 462 ft. over all, 62 ft. beam and 29 ft. molded depth. These dimensions having been fixed, the problem of obtaining the necessary strength was, of course, the primary difficulty. Doxford & Sons undertook the work on their special type of turret deck vessels which is a form lending itself naturally to great longitudinal strength. The upper portion of the vessel above the ordinary molded depth is continued upward, forming a central structure which runs fore-and-aft throughout the vessel. The combined form of the upper works are concave outer gunwale and convex inner gunwale, and the main strength of the vessel is in the form of sheerstrakes and stringer plates which are fitted on the upper portion, and all the shell plates are rolled to the concave and convex form, thus enabling the whole of the upper material to take up equal stress without any buckling, which is the greatest difficulty in the ordinary flat form of deck. In the Grangesberg the natural strength is, however, supplemented by the hatchways being fitted in pairs, which enables a continuous longitudinal girder to be built at the center line of the vessel, and carried all - fore - and - aft, above which are also fitted extra central stringer plates.

BOW VIEW OF THE GRANGESBERG.

The steamer is loaded by means of shore spouts, which are six in number, and therefore the hatchways are limited to this number; but being divided by the longitudinal girder, previously referred to, there are formed actually twelve hatchways into the six holds, and to further subdivide the ore in falling from the chute, each of the hatchways is fitted with a special V, forming permanent division 'thwartships, resulting in the complete cargo of the vessel being divided into twenty-four heaps. The discharging conditions necessitated the vessel having complete gear on board, as she lies in open water and discharges the ore into

GRANGESBERG, LOOKING AFT.



GRANGESBERG AT THE DOCK.

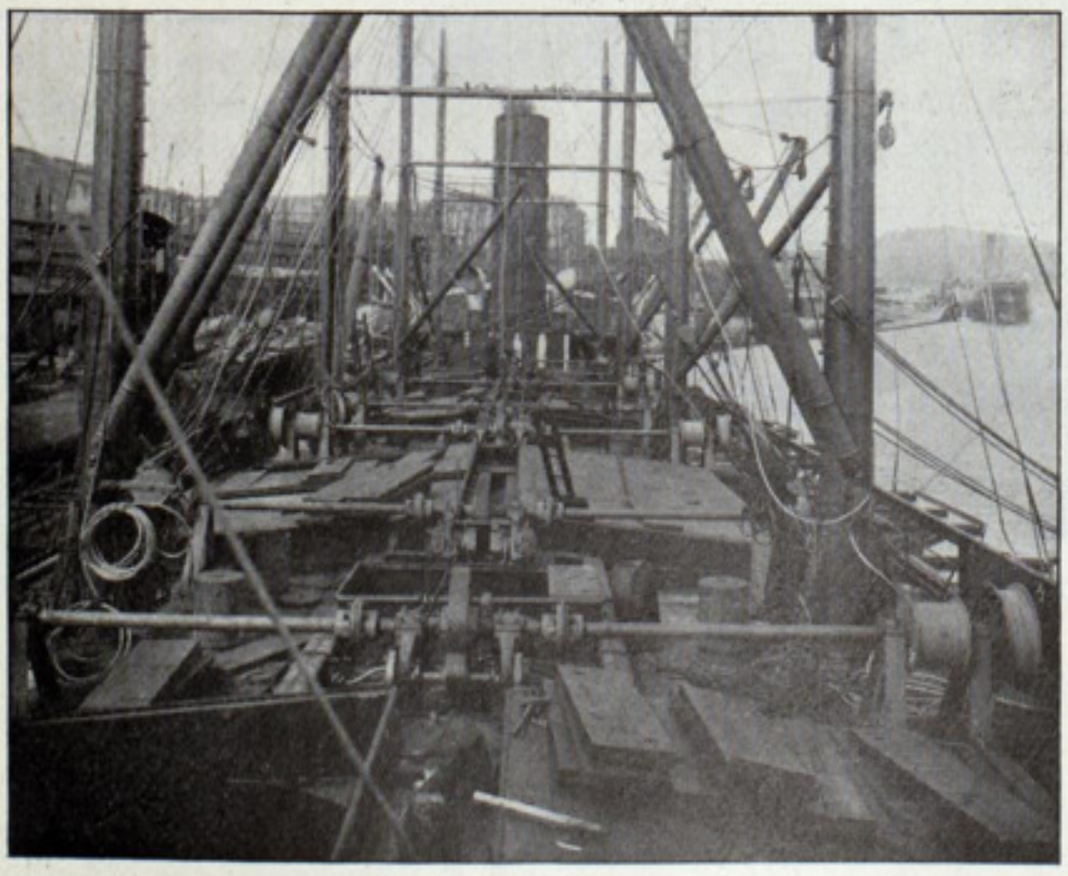
barges on both sides. She has discharged fully 10,000 tons in 30 hours.

Ballasting such a vessel is a point of great importance and this has been satisfactorily done by supplementing the double bottom arrangement with a large fore-peak tank for balancing machinery, and a high tank in No. 3 hold, which is also arranged by raising the mean center of gravity considerably to the advantage of the vessel when loaded.

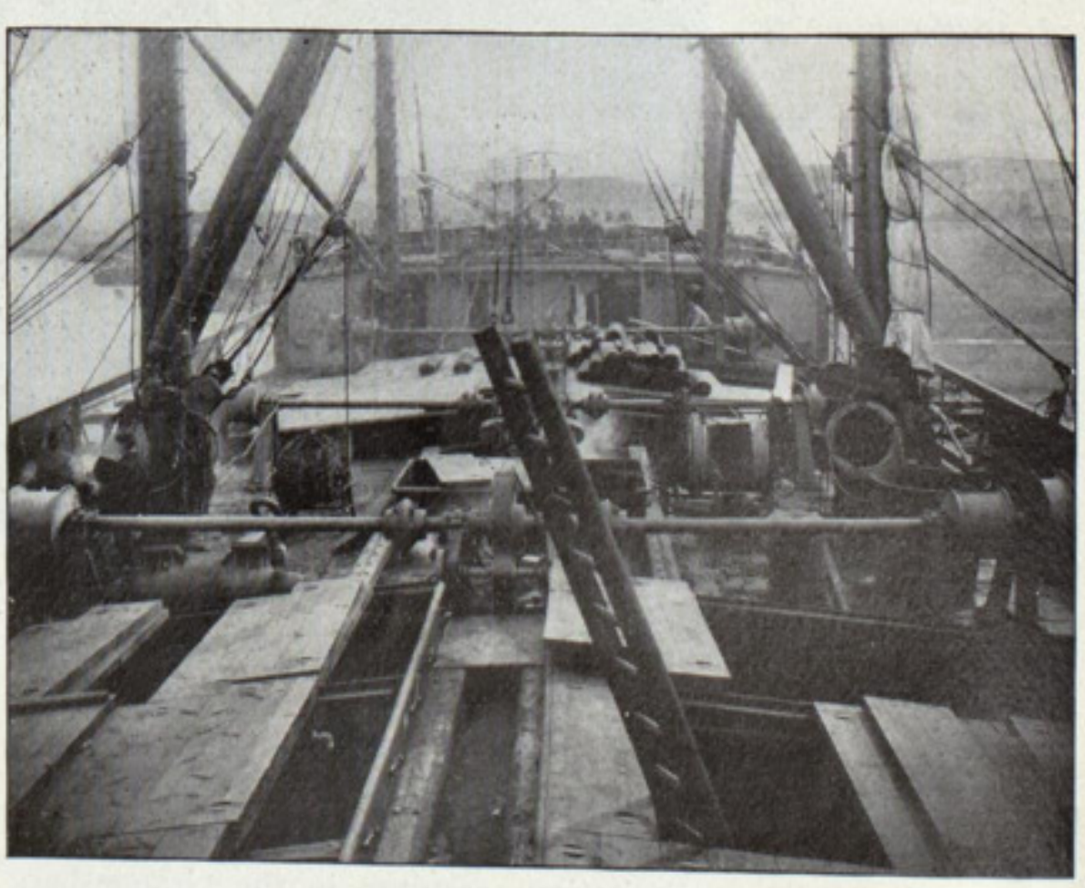
Several model experiments were undertaken before the design of engines was determined upon, owing to the vessel's extreme proportions. Her engines are 2,400 H. P., enabling her to steam 10½ knots an hour when fully loaded. To develop this power in a suitable manner the engines were fitted with cylinders of 26, 44 and 72 in. diameter with common stroke of 51 in., supplied with steam from three boilers that have a heating surface of 7,600 sq. ft. and which are fitted with Howden's system of forced draft. The steering of the vessel was also the subject of considerable investigation, and the results of the arrangements fitted have been most satisfactory. Instead of the ordinary rudder the vessel is fitted with a balanced rudder, designed by the builders, somewhat on the line of rudders fitted to ordinary government cruisers, but having a special fitting of a bottom bearing which is seen indicated in the accompanying line drawing. This kind of rudder enables the steamer to be maneuvered in very close waters with great reliability and evenness on both helms. The cost of the Grangesberg works out to £7.10 per ton on her deadweight carrying capacity.

GRANGESBERG, LOOKING FORWARD

Of course comparisons are unfair. The discharge of 10,000 tons from the Grangesberg in 30 hours through six hatchways into barges lying alongside is

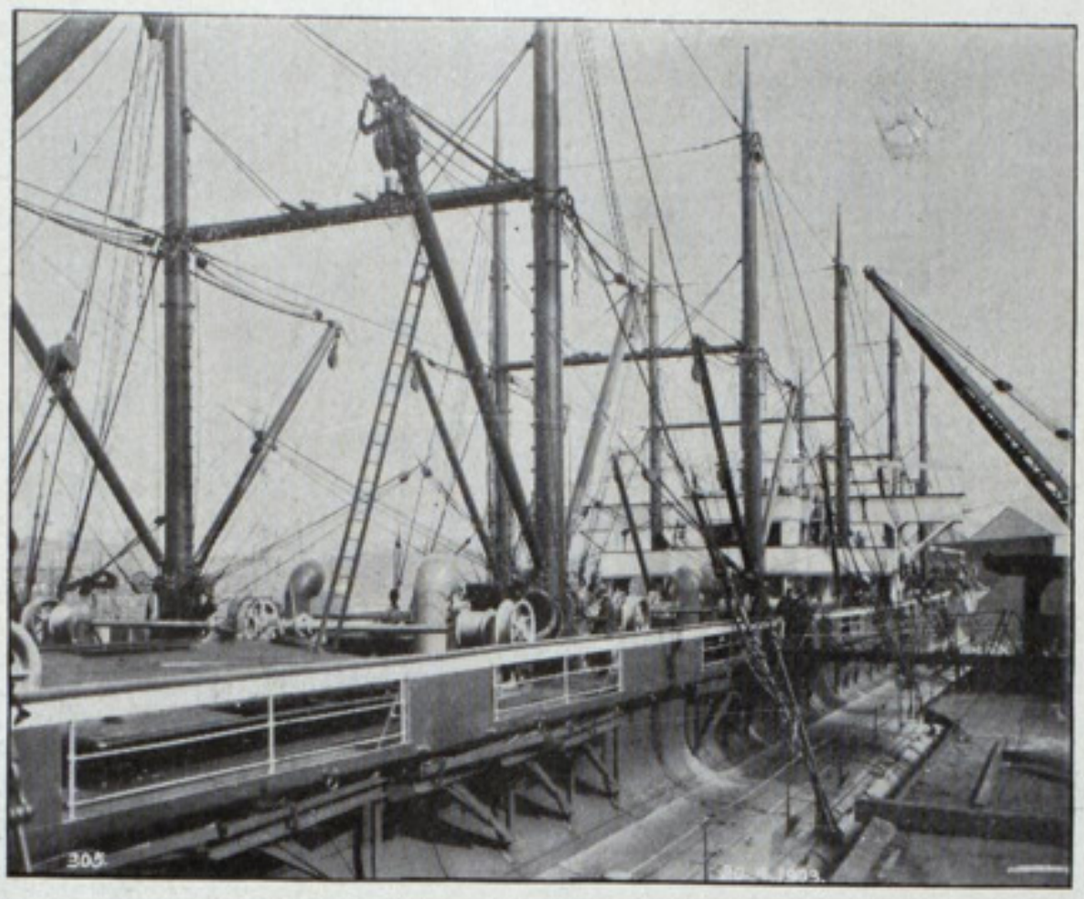


DECK OF GRANGESBERG, LOOKING AFT



HATCHES OF THE GRANGESBERG.

remarkable work; but ore handling on the great lakes is a highly specialized industry. The ships have been really designed to meet the necessities of the unloading machines, and both have resulted in incredible dispatch. The present record of dispatch in unloading is 5,200 tons in 3 hours and 52 minutes. This amount was taken from the steamer James H. Hoyt in that time by four Hulett clamshells at Conneaut. In fact, no more than four machines have ever worked in establishing the records which have marked the present year. Of course the Hoyt is especially constructed to facilitate unloading. She has twenty-one hatches, spaced 12 ft. centers. As soon as the clamshells are finished with one set of four hatches the vessel is moved until the next set of four hatches are directly under the machines. The Hoyt was the first vessel to be constructed with this extraordinary number of hatches.

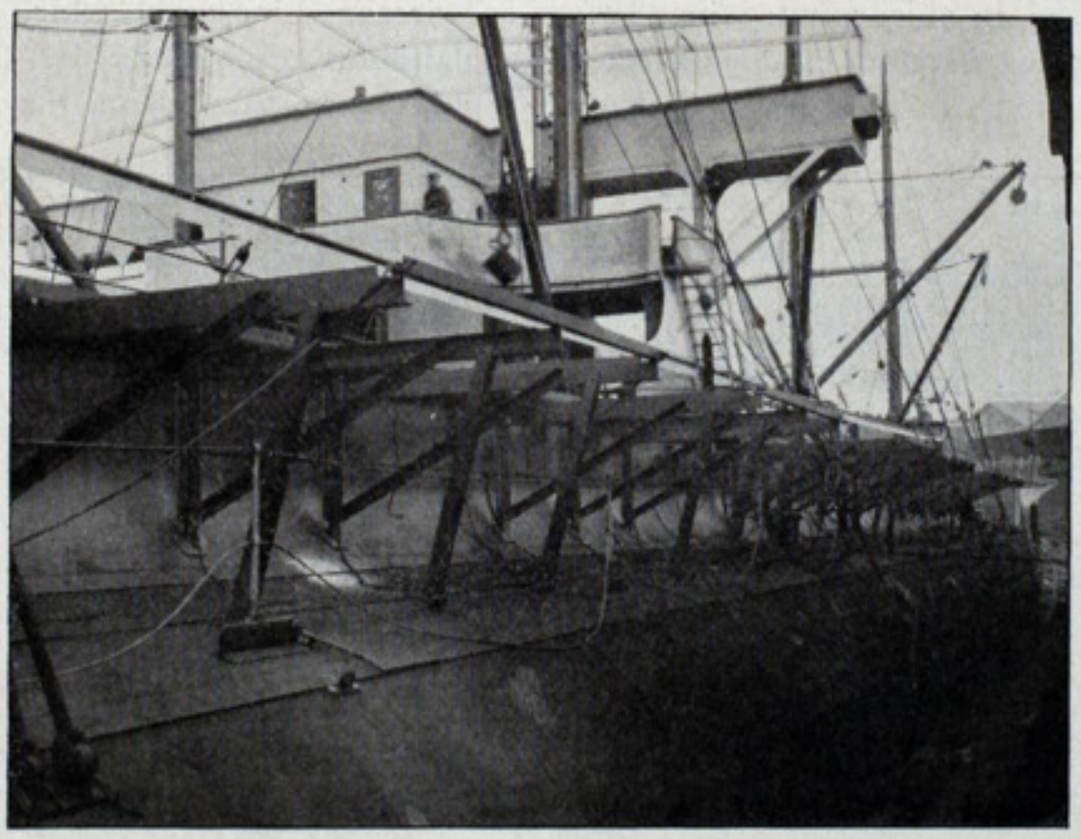


GRANGESBERG, LOOKING FORWARD.

The ton-cost of the Grangesberg, indeed, works out to a very low figure. During the period of high prices the ton-cost of lake ships, measured on dead-weight carrying capacity, has been about $45.

AUGUST BELMONT.

A strange looking craft indeed is the August Belmont, built by C. S. Swan & Hunter, Wallsend-on-Tyne, England, for the Louisville & Nashville Railroad Co. She carries coal between Pensacola and Tampico. She is equipped with a patent discharging gear which will permit of the discharge of a full cargo of 6,080 tons in about eleven hours. It is this discharging gear which constitutes the chief specialty of the ship and which is responsible for her peculiar appearance above deck. Her spacious holds are fitted with eight large hatchways, and these are served by five powerful derricks, in the nature of stump masts, to which the patent discharging gear, known as the Dodge discharging gear, constructed by the McMyler Manufacturing Co., Cleveland, is attached. The object of this gear is to discharge coal at the utmost rapidity by means of grabs. The gear discharges from one side of the vessel only. It consists of a transporter for each hatchway, the keel of which has a swivel deck plate, which is held in position by a track riveted to the deck, composed of angle irons and extending almost the whole length of the vessel abreast of the hatchways. The heel of the transporter can be moved in a fore-and-aft direction by suitable ropes worked off the steam winch ends. The head of the transporter is supported by spans between the masts, so that it can be slewed or elevated as required. On the transporter runs a trolley wagon which is hauled out by a wire rope, which also suspends the grab and is connected to a large-sized winch drum. The trolley wagon runs down the transporter by gravitation. There is also a similar rope from another winch barrel, which also passes over the end of the transporter, and then is connected to the opening and closing gear of the grab. There is a third rope which is connected to a lever which temporarily fixes the trolley wagon at any required height. The latter line is worked by a lever mounted on an intermediate operated upon by the foot of the winchman. The other two lines are, as before stated, led to two independent drums on the main shaft of the steam winch, and each of these barrels are worked by independent clutch gear. The winch always goes in one direction. The hauling on the transporter of the trolley wagon with its grab and load is performed by the winch; the lowering of same down the transporter is by gravitation alone. The winch is direct-acting, having cylinders 12 by 16 in., and is worked by levers placed by the side of the hatch. It has about 40 I. H. P. In addition to the before mentioned drums there are two winch end shafts. These are required for general purposes, such as the slewing and elevating of the transporters, etc.



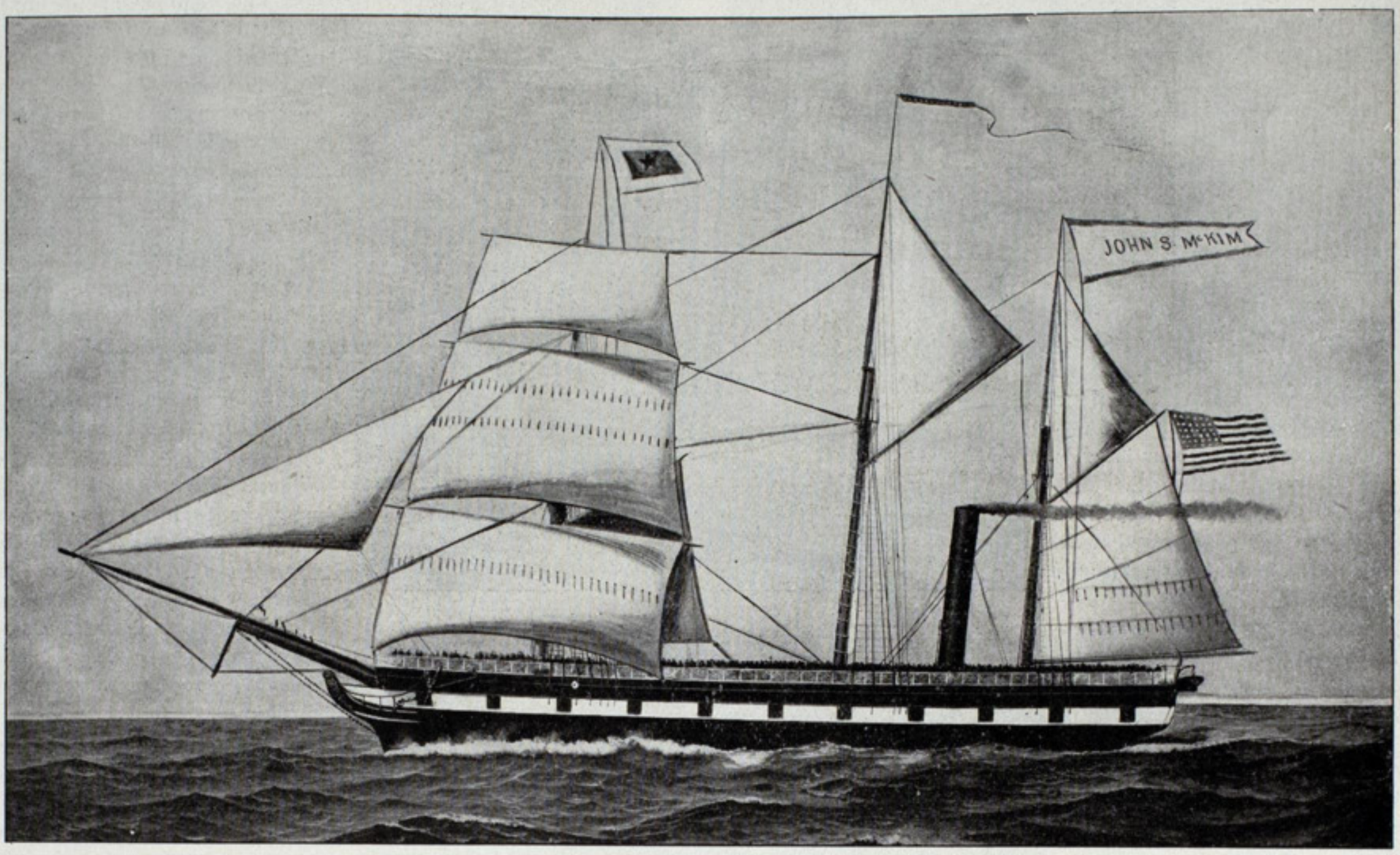
GRANGESBERG'S BULGING SIDES.

The method of operation is this: Let us presume that the carriage and grab are at their lowest point, say at about the center of the hatch, the carriage being stopped in this position by an adjustable stop secured to the transporter at the required position. The winchman then disengages the drum, which allows the grab to fall by gravitation into the hold with its mouth open. The second line is then hauled taut and closes the grab. The other line, together with the grab line, is now hauled taut by the winch, which hoists the grab and its load, until it comes up to the trolley wagon, when the trolley wagon and its load is hauled up the transporter to the required distance or height. If it is required to discharge the coal into a truck at a comparatively short distance below the grab, the rope is hauled taut, which opens the grab, allowing the coal to fall into the truck, but if the coal is required to be lowered into say a lighter and without unnecessary breakage, then the trolley wagon is hauled out still further, until it is caught and detained by the lever, when the grab can be lowered from the trolley wagon after the trolley is held in position, and when lowered the grab can be opened at any distance and the coal discharged into the lighter. The whole operation therefore requires at least two runners, and if the grab and coal have to be lowered into a lighter then three ropes are required. Each of the gears are to discharge 100 tons of run-of-mine coal per hour, so long as there is 2 ft. of coal under the grab.

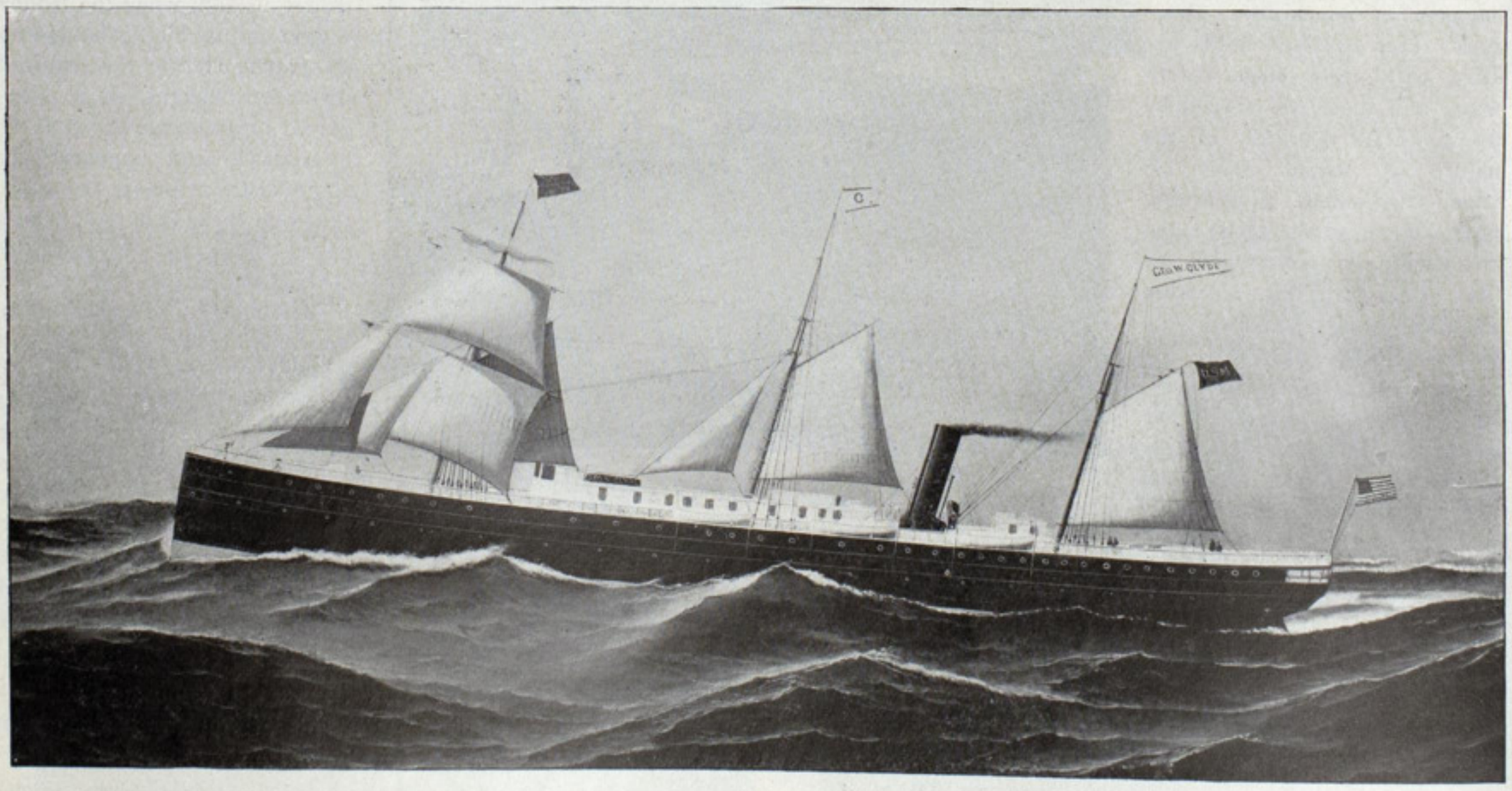
There are six of these transporters working eight hatchways. The weight of this gear, beyond that of an ordinary ship's gear, is estimated at 90 tons.

DEVELOPMENT OF THE CLYDE LINE.

The Clyde Line from small beginnings in 1844 has grown into one of the largest steamship services in the coastwise trade. The Clyde family have been in the transportation business for three generations. Mr. Thomas Clyde, the father of Wm. P. Clyde, was the founder of the Clyde Steamship Line. Upon the arrival in this country in 1837 of the late John Ericcson, celebrated inventor and engineer, with his invention for the application of the screw propeller to steam vessels, Mr. Thomas Clyde at once recognized the value and the great possibilities of this new method of applying power for the propulsion of vessels. He was a co-laborer with Ericcson in the application and introduction of the screw propeller. He was one of the owners and originators of the first propeller lines ever built, which was called the Ericcson Line, and which runs between Philadelphia and Baltimore. In 1844 Mr. Clyde built the propeller steamship James S. McKim, the first screw steamship built in the

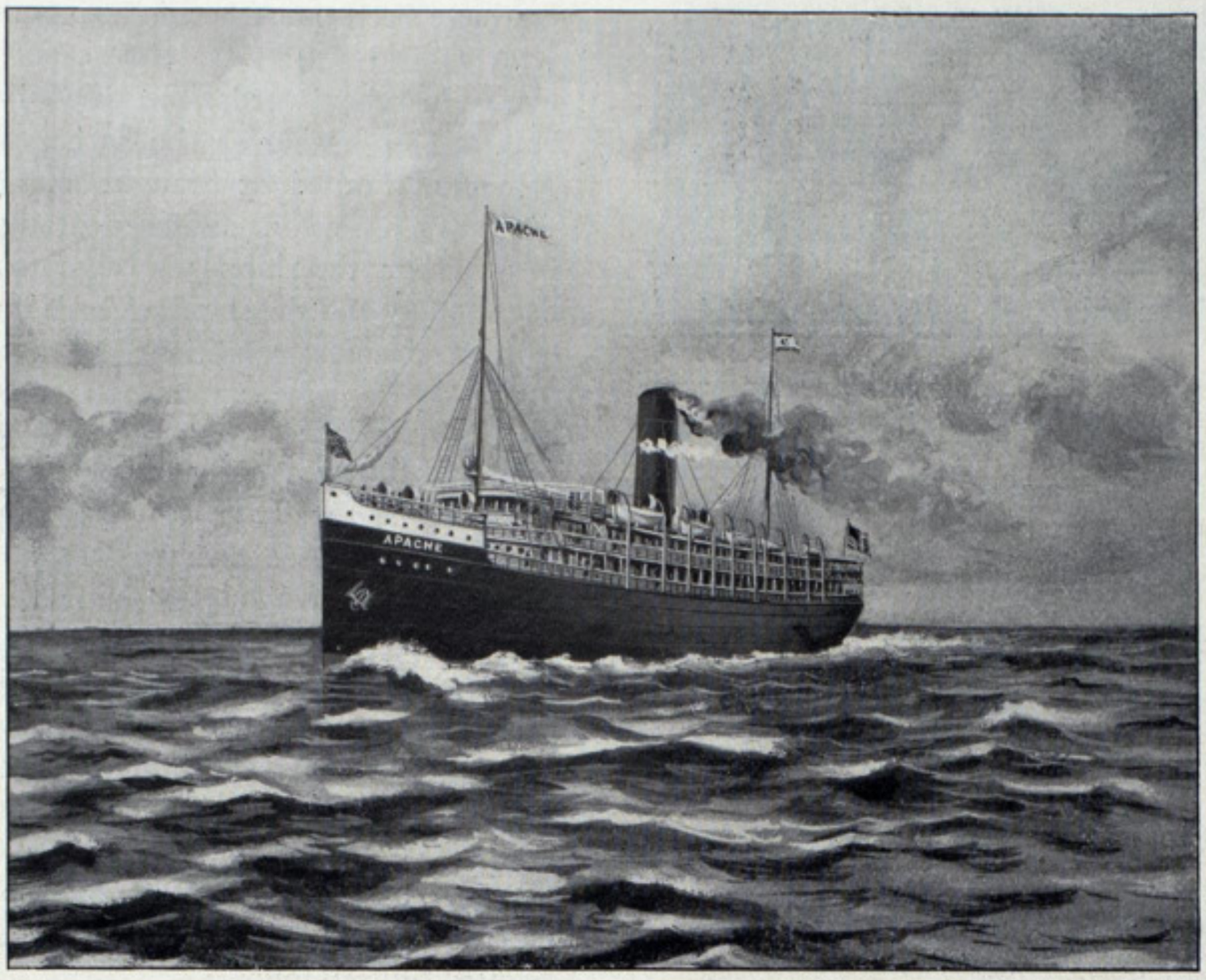


JOHN S. McKIM, FIRST SCREW STEAMSHIP BUILT IN THE UNITED STATES FOR COMMERCIAL PURPOSES.



THE STEAMER GEO. W. CLYDE, ONE OF THE EARLY CLYDE LINERS

United States for commercial purposes, thus recognizing and practically applying nearly fifty years ago this method of obtaining high speed with economy and safety which has, except in sheltered waters, superseded all other methods of steam propulsion. Upon the breaking out of the Mexican war, this ship was used successfully as a transport of troops, and in 1846 carried Col. Jefferson Davis' regiment of Mississippi volunteers from New Mexico to New Orleans. It is a coincidence that another of Mr. Clyde's steamers, the Rebecca Clyde, in 1865 took Jefferson Davis as a prisoner from Savana to Fort Monroe. All during his life Mr. Clyde has had especial preference for the screw propeller, and has experimented many times upon its practicability even for shallow harbors and rivers. He is credited with having built in 1871 the first compound engine ever constructed in this country and placed it in the George W. Clyde, which was at that time the largest light draught steamer afloat. Mr. Clyde also built in 1886 the first large triple-expansion engine built in this country and placed it in the steamer Iroquois, one of the first steel steamers built for commercial purposes in the United States.



CLYDE LINER APACHE.

[Built by Cramps, Philadelphia.

The firm of Wm. P. Clyde & Co. own and control a large number of steamboats, their lines running between New York, Charlestown, S. C., and Jacksonville, Fla., and on the St. John's river between Jacksonville, Fla., Palatka and Sanford, Fla.; Boston, Providence, New York, Philadelphia, Baltimore, Washington, Norfolk, Richmond; and also from New York to Turk's Island, San Domingo and other West Indian ports. Mr. W. P. Clyde for some years controlled all the steam transportation between New York and San Francisco, as well as the Panama railway, the only route across the isthmus of Panama, having from his own fleet been able to furnish this railway in sixty days a complete equipment of steamers for connection both from Panama to Central America and San Francisco and also between Aspenwall and New York. He was president of the Pacific Mail Steamship Co. for several years.

The Apache, one of the new steamers of the Clyde Line, which is now operating some fifteen or sixteen large steamers between principal ports on the Atlantic seaboard, is illustrated herewith. This vessel is, with her sister ship, the Arapahoe, the latest addition to the Clyde Line. The Apache was built by the Cramps of Philadelphia. She is 310 ft. long, 46 ft. wide, and 31 ft. deep, and has a speed of 15 knots, with a capacity for 3,000 tons of cargo. The vessel is admirably arranged and handsomely decorated. Her accommodations for over 200 passengers are located entirely above the upper deck, thus insuring the best of light and ventilation at all times. She is lighted throughout by electricity, and her fittings and equipment are up to the highest standard.

MERCHANT.

The first iron vessel built on the great lakes for commercial purposes was the propeller Merchant of 720 tons, the first cargo boat to burn coal under her boilers. The Merchant was built in Buffalo in 1861 for J. C. & J. T. Evans and was completed in 1862. She was a success from the start. When built she was valued at $90,000. She was lengthened in 1872 and her value was thereby increased to $120,000. In 1875 she struck on Racine reef and sank, becoming a total loss because the season was so far advanced that it was useless to try to raise her. From 1862 to 1875 she paid the underwriters for insurance on hull and eastbound freight $154,535.80. The total amount on account of insurance during that period was $143,913.35, leaving a profit to the underwriters of $10,622.55. During the career of the Merchant she sank twice in Detroit river and once in a fog on Lake Michigan through striking on rocks and shoals. The Merchant during her life was a great money-maker, the freight on wheat from Chicago to Buffalo at that time being as high as 25 cents a bushel.

NEW GERMAN LAUNCH.

A new steam launch has been evolved in Germany. The model on the water line represents a wedge or triangle, so that when driven at a high speed no bow wave is formed and the water line is absolutely straight. This is due to the fact that the stream lines or currents are not subjected to a constant change in direction as in ordinary boats. The molded depth of the boat is greatest at the bow, the line of the keel rising as it extends aft; at the stern the bottom rests practically on the surface while the engine shaft continues in a straight line. Thus the propeller, which is well under the deadwood, has a free flow of water. The rudder is forward of the propeller above the shaft, and projects through the bottom of the boat. To give lateral support to the stern this part of the structure is increased in width. The boat is said to steer well and to give a high propulsive efficiency. This launch is 36 ft. long, 6.8 ft. beam at the stern, and 1.6 ft. draught forward. She has been built by Escher, Wyss & Co. of Zürich for a rowing club on the Rhine, requiring special maneuvering qualities, quick change of speed, and silent working. High speed steam engines were preferred to oil or other motors and a speed of 14 knots is expected.

MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Company,

CLEVELAND, OHIO.

CLEVELAND: WADE BUILDING.
CHICAGO: MONADNOCK BUILDING.
DETROIT: HAMMOND BUILDING.
NEW YORK: 150 NASSAU STREET.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, $3.00 per annum. To Foreign Countries, $4.50. Subscribers can have addresses changed at will.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

JUNE 2, 1904.

The present number of the Marine Review, it will be observed, is devoted to the development of the freight carrier. It was Mr. Gladstone who said that the nineteenth century had added more to the material wealth of the world than all the centuries which had preceded it. There will probably be none to dispute this statement because all of the really great inventions which have done so much to enable man to utilize the resources of the earth are the products of the genius of the nineteenth century. Mr. Gladstone's statement can probably now be refined to say that the past twenty years have added more to the material welfare of the world than all the years which have preceded it. Taking up even one single branch of industry, such as the freight carrier, and entering into its development, one is very much surprised to discover how very recent it is. In fact it is a matter of the past ten years. Certainly since 1899 the cargo steamer has been phenomenally developed both in ocean and lake trade. Twenty years ago the average cargo on the great lakes was about 1,000 tons; ten years ago the largest cargo on the great lakes was 2,500 tons; today the average cargo of the modern steamer is 5,000 tons, and this is being rapidly increased by the introduction of steamers whose average load will be from 7,000 to 8,000 tons, and in one instance 10,000 tons. In the salt water trade the figures are even more striking and a number of steamers have been constructed during the past four years with a dead-weight carrying capacity of over 20,000 tons. In other words, the shipbuilder is prepared to build a ship as big as the harbor will float. Size is, of course, limited by draught, but it is observed that whenever a few inches more draught can be secured in a harbor, the shipper is eager to take advantage of its economy and the ship builder is unfailing in his skill to meet the new conditions.

Would the great railways of the United States have flourished as they have were it not for the magnificence of congress? Are not the enormous grants of land which have been made to the trunk lines subsidies in effect? Congress thinks nothing, absolutely nothing, of appropriating millions upon millions of dollars for the carriage of the mails on the railways of the United States. The sums are simply staggering in the aggregate. In the past seven years congress has appropriated for railway mail transportation $238,776,000, and in addition to that has appropriated $31,856,962 for the construction of railway postoffice cars. The detailed figures follow:

Year.	For railway mail transportation.	For railway post-office cars.
1898	$30,450,000	$3,759,502
1899	31,579,000	4,000,000
1900	33,275,000	4,204,000
1901	33,870,000	4,561,000
1902	34,700,000	4,816,000
1903	36,260,000	5,104,000
1904	38,642,000	5,411,000
Total	$238,776,000	$31,856,962

It will be observed that even the equipment is furnished. All that the railways have to do to earn this enormous sum of money is to haul the cars. This revenue of the railway is entirely independent of its ordinary passenger, express and freight business. It is a revenue which is as certain as the ebb and flow of the tides. It is something which can be depended upon in fair weather and foul, in times of adversity and in times of prosperity and it would be idle to argue that it has not had its effect upon the wonderful development of the railway systems of the United States. This generous help for mail carriage has enabled the railways to extend their service over hundreds of miles of sparsely settled country and to develop trade where formerly only the sage brush and cactus thrived. The United States seems to have pursued the same policy towards mail transportation by rail that Great Britain has towards mail transportation by water. Great Britain has pushed her wares in all the markets of the world by appropriating great sums for the oversea carriage of mails by steamers. By this policy persistently pursued for forty years she has extended her trade to the remotest quarters of the earth and has so

multiplied her steamships that she is now supreme upon the seas.

In contrast to this sum of $238,766,000 paid to the American railways there is the pitiful exhibit of $998,000 paid to American steamers for ocean mail carriage. Think of it. Does anyone suppose for a minute that if congress had given aid to shipping similar to that which it has given to the railways that the merchant marine would be in its present deplorable condition? Far from it. Trade lanes would now be established to the furthest reaches of the earth and the stars and stripes would be flaunting from the stern of thousands of ocean steamers.

To paraphrase a famous saying we have millions for defense but not a cent for shipping. During the past seven years congress has appropriated $437,177,849.68 for the support of the navy and $526,325,974.25 for the support of the army. Detailed figures follow:

Year.	Navy.	Army.
1898	$33,003,234.19	$23,129,344.30
1899	56,098,783.68	23,193,392.00
1900	48,099,969.58	80,430,204.06
1901	61,140,916.67	114,220,095.55
1902	78,101,791.00	115,734,049.10
1903	78,856,363.13	91,730,136.41
1904	81,876,791.43	77,888,752.83
	$437,177,849.68	$526,325,974.25

Here, then, is an appropriation of nearly half a billion dollars for the defense of what? Surely not for the defense of American shipping for there is none. The International Mercantile Marine Co., commonly known as the Morgan shipping combination, comprises 112 ships, but of this number only four of them are flying the American flag—and of those four only two of them were built in the United States. Yet congress appropriates every year nearly $100,000,000 for naval defense. The chief thing which every nation has to defend, reduced to its ultimate analysis, is its trade. The United States has no over-sea trade to defend. All its exports go abroad under other flags. Yet $100,000,000 was voted for 1905 for war ships and their guns and armor. Not a penny is appropriated to develop American seamen to man these guns. The American seaman does not exist. The merchant marine should be the nation's naval reserve. The army has a reserve in its militia; but the United States can have no adequate naval reserve until it has an adequate merchant marine.

In all this lowering of clouds there is one ray of light—and that is the Merchant Marine Commission which is at present making an inquiry into this very thing. This commission, consisting of five United States senators and five representatives, was appointed by congress at its last session to inquire into the state of shipping in the foreign trade. The commission is holding meetings in various parts of the country and has already been favored with the experience of several men eminent in various departments of national industry. This commission has already held meetings on the coast and will begin its sessions on the great lakes during the latter part of the present month. The first lake meeting will be held in Chicago on June 24th and will be followed by other meetings in Detroit and Cleveland. When this commission comes to the lakes it will have the pleasure of seeing the greatest merchant fleet in the world devoted to a single industry, and every vessel flying the American flag. Protection has done this for shipping on the great lakes. It can do the same for shipping on the ocean.

"THE MAN AT THE WHEEL."

Who is responsible?

For the fact that the people of the United States have been kept in the dark concerning the extent to which the nation's merchant marine has almost completely passed away.

Who is responsible?

There is today more widespread and universal ignorance with reference to the truth concerning what should be a greater factor in our industrial and commercial life, especially as regards our foreign trade and foreign relations, than any other feature of this country's development.

And who is responsible?

We do not mean who is responsible for the loss of commercial power, loss of prosperity, loss of trade, loss of foreign markets and loss of that prestige which means business.

We do not refer to the annual loss to the nation and its farmers, manufacturers and working people of the millions of dollars that would be ours if we had pursued a different policy in this respect.

We know who are responsible for all this.

Simply the people.

Give the great American people the exact facts, tell them the truth, the whole truth, conceal nothing. Come out into the open, and if the issue is a deserving one, watch them.

Watch the people.

And see how quickly congress will fall into line.

When the citizens of America are once posted and have made up their minds, then congress does not need to be urged.

Not much.

They know their little lesson by heart and can recite it backwards.

Every time.

They simply act.

And they do it promptly.

There never was such an obliging body of men on earth as the members of the United States congress.

They are willing to work overtime and sacrifice much for their friends at home.

Because these friends have votes.

That's all.

Just votes.

And if the people of America ever learn the exact truth about the injury the country is undergoing every day through its national weakness caused by its loss of sea power, they will come to some conclusion.

And do it in a hurry too.

And they won't have to tell congress what to do either.

Somehow or other they know a little in advance generally when it comes to questions of this kind.

Susceptible, as it were.

Sensitive too.

Extremely so.

Especially when anything concerning the country's honor or the country's flag is at stake.

All hands get right up to the front of the firing line in a hurry.

Where they can be seen.

And heard too.

And the speeches they deliver and those they would like to deliver are printed in the Congressional Record.

Just to show what they could and would do if they had the chance.

And any legislation that appeals to or is supported by the great American people goes with a rush.

And the people are most generally always right, too.

And when they fully realize and know the simple truth about our merchant marine, then will something be done.

And not before.

Never.

A hundred special commissions and special committees might be appointed to make as many investigations and reports, but their preparation would be simply time and money thrown away.

Unless as one result the people of this country should become thoroughly informed and popular interest should be once aroused.

Then your hundred reports would be cheap at any price.

But they know nothing as to the exact conditions now.

They are always willing to listen, however, and those who should either from self-interest or patriotism have taken upon themselves this educational campaign sooner, have not done so.

And the result is before us.

The American flag has become nearly extinct upon the ocean highways of the world.

Who is to blame?

But aside from that, the Merchant Marine Commission appointed is busy trying to get at the fact and secure such suggestions as may serve as a guide if in the judgment of the people some legislation should seem to be desirable.

They are working hard and in some cases have had to sit late at night and to keep on the move from one city to another in a way that has proven that they are very much in earnest and are meeting those who are equally so.

And they are learning a great deal about the situation, that in spite of the fact that they were well informed in the beginning, must surprise them more and more each day.

In the first place, practically everyone who has been before the commission has agreed to the main facts concerning the pitiful situation as it now exists.

Then again it was quickly apparent that there was no narrow partisanship either in the committee itself or those who appeared before it, and no one could have told as a rule from the statements made or the questions asked or answered to which political party either individual might have belonged.

This is as it should be.

There is an entire absence of any suspicion that those who might be most directly interested had in any way united to urge any special form of legislation, because they practically all differed when it came to urging a remedy.

Doctors nearly always do.

No two really thought alike.

And this too, after the years of study they had all given the subject and the vast amount of discussion that has taken place.

To some this lack of harmony might seem like an element of weakness.

But it is really the reverse.

It proves absolutely an absence of concerted action that the un-American enemies of our merchant marine have been in the habit of insisting existed and dwelling upon at great length.

But the most forceful and expressive statements that have been made have after all come from the man who spoke as an American citizen only and not as a ship owner or ship builder or as being directly interested in any way in maritime affairs, but who realized that something should be done or America's position as a manufacturing country would continue to be more and more seriously affected.

And these are the kind of arguments that count.

As we have said before, the marine interests of America must belong to and be a part of the entire nation and not to any small portion or be confined to any one section.

One of the mistakes of the past has been in not destroying the thought that it was in any way a sectional matter.

And until a full realization of the far-reaching influence of the whole question is brought home to the citizens of every state in the union we can hope for nothing.

And we should have nothing.

If this had been done earlier the situation might have been far different today.

Who is responsible?

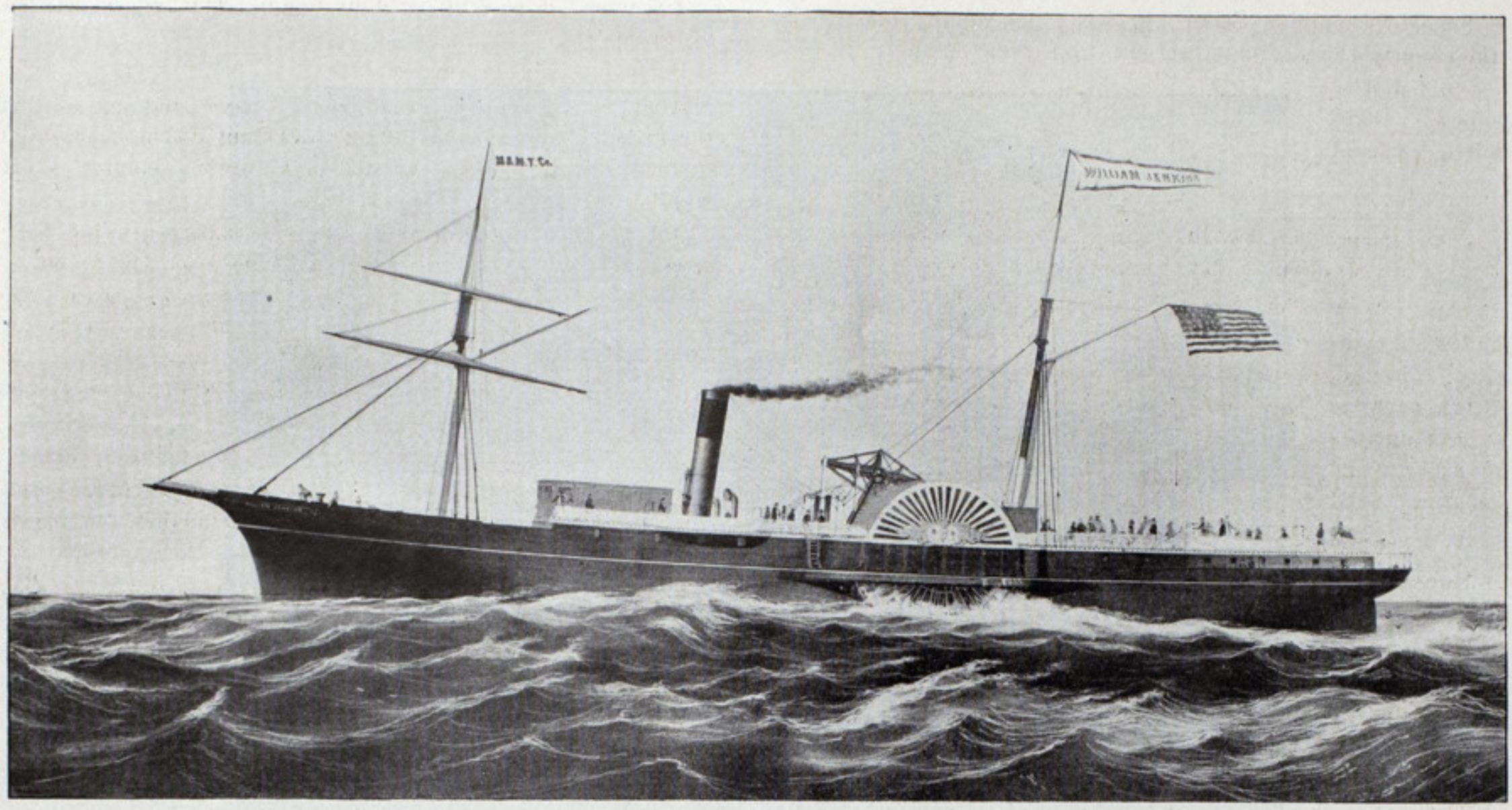
DOMINION LINE TRANSFERS.

The Dominion Line branch of the International Mercantile Marine Co. have completed arrangements for restoring this summer their weekly service of passenger steamers between Liverpool and the St. Lawrence. The Canadian fleet will be composed of the five steamships, Canada, Dominion, Kensington, Southwark and the Germanic, the latter formerly engaged in the White Star New York service, and renamed the Labrador. The boats will leave Liverpool weekly on Thursdays, and the first sailing will be by the Dominion on April 21 for Quebec and Montreal. The Vancouver and the Cambroman are not intended to remain in the Canadian service, their places being taken by the new boats named. The Dominion Line will still continue their regular weekly service of cargo and cattle steamers between Liverpool, Halifax and Portland. When the steamers Canada, Kensington, Dominion and Southwark are transferred, the Halifax and Portland service will be maintained by the Cornishman, Norseman, Ottoman and others.

WILLIAM JENKINS AND NANTUCKET.

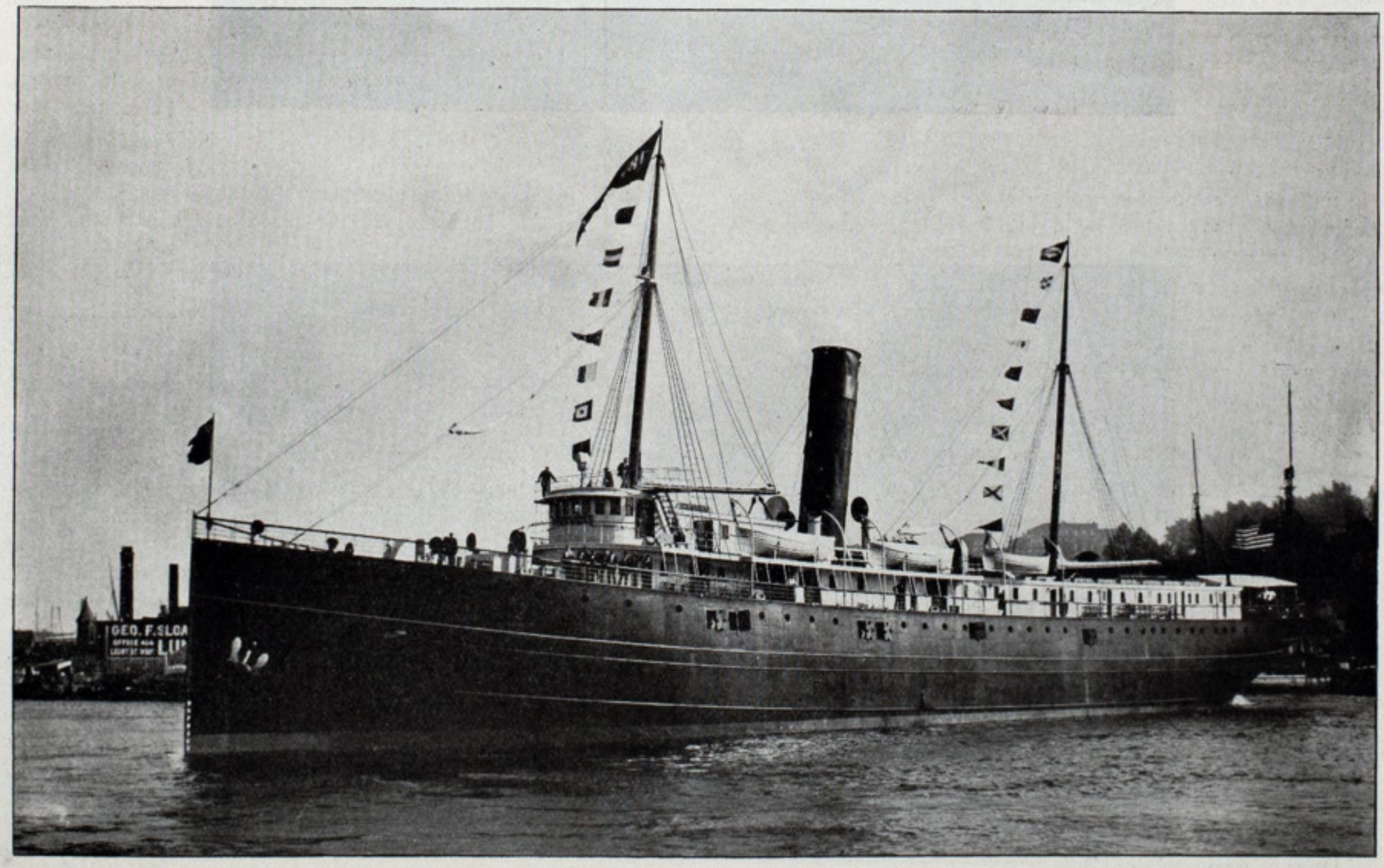
The Merchants' & Miners' Transportation Co., Baltimore, Md., began business in 1854 with two ships, making a trip a week between Baltimore and Boston for transportation of freight and passengers. The first of the two steamers built by this company when it started in business was the William Jenkins. She was a wooden side-wheel freight and passenger boat 200 ft. long, 33 ft. beam and 17 ft. depth, of 1,000 gross tons. She had a beam engine of 375 H. P. and a speed of about 9 knots. She was built in Baltimore. Since then the company has developed wonderfully so that it is now operating five lines, one between Baltimore, Virginia ports and Boston, making four trips a week; one between Baltimore, Virginia ports and Providence, making three trips a week; a line between Baltimore and Savannah, making three trips per week; a line between Philadelphia and Savannah, making two trips per week; and a daily line between Baltimore and

the Virginia ports. The company is now having built its thirtieth ship at the yard of the New York Ship Building Co., Camden, N. J., which when completed will be known as On-



SIDE-WHEEL STEAMER WILLIAM JENKINS, THE FIRST STEAMER OWNED BY THE MERCHANTS' & MINERS' TRANSPORTATION CO., BALTIMORE, MD.

tario. She is a single screw steel freight and passenger steamship, 315 ft. long, 42 ft. beam and 34 ft. depth of hold. Her gross tonnage is 3,300. She has triple expansion engines of 4,000 H. P., double-ended boilers with induced draught and is designed for speed of 16 knots. She has all modern auxiliary, such as feed pumps, feed boiler heaters, ash ejector, electric lighting plant. The accompanying photograph of her sister ship Nantucket will show the general characteristics of the Ontario.



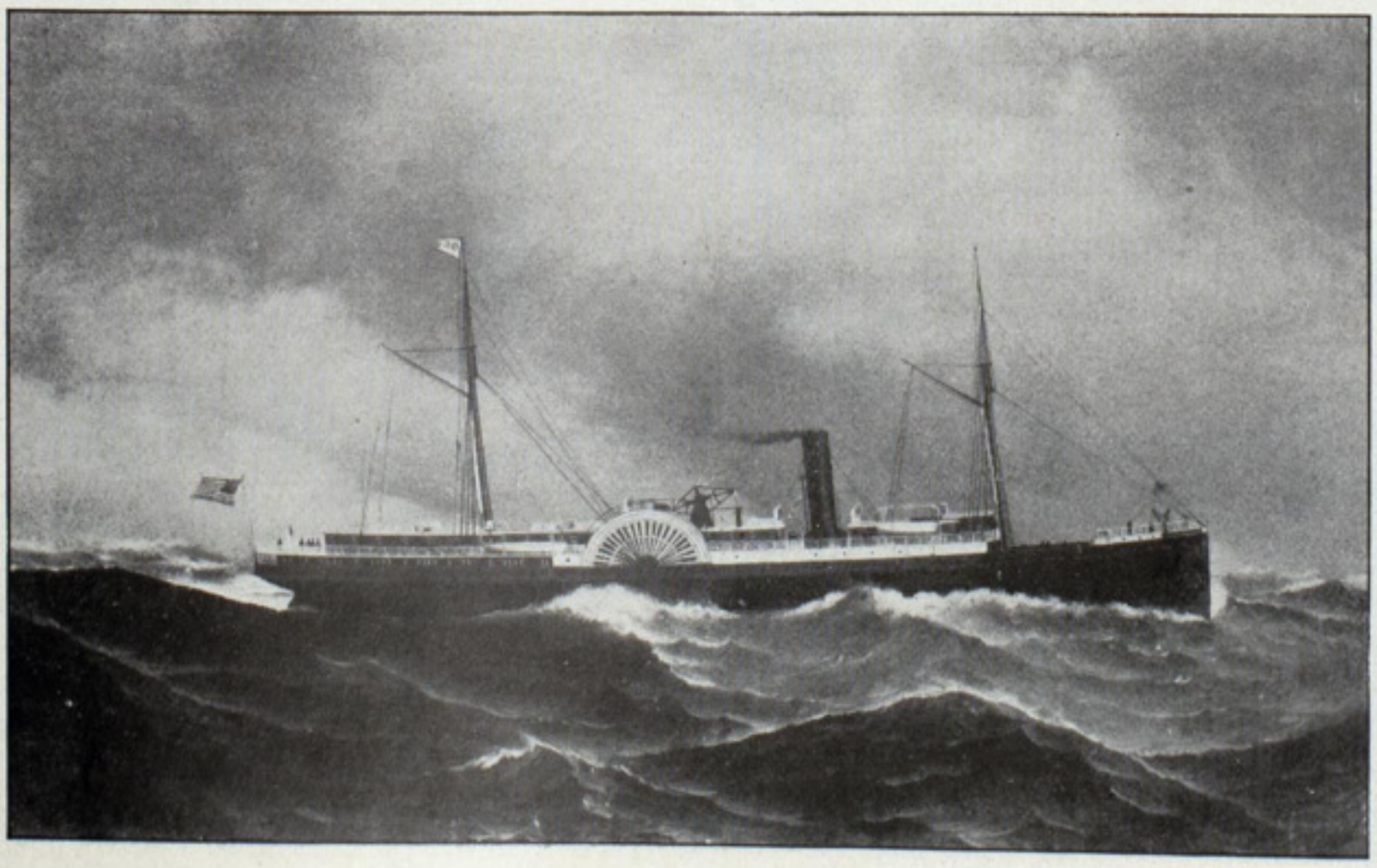
STEAMER NANTUCKET, OWNED BY THE MERCHANTS' & MINERS' TRANSPORTATION CO., BALTIMORE, MD.

Old Dominion Steamship Co.

The Old Dominion Steamship Co. which conducts a general passenger and freight service from New York to Norfolk, Portsmouth, Richmond, Va., and James River points, is characteristically American. From very modest beginnings, indeed, it now operates a great number of splendid steamers and probably the evolution of the freight carrier can well be traced from the development of this company. The company has favored the Marine Review with a photograph of the old steam brig New York, which was built at the foot of New Castle St., Norfolk, in 1821 by William F. Hunter, ship joiner. She was of 281 tons burden and 50 H. P. The motion of her machinery was steadied by a big fly balance wheel. It is curious to note how very closely the New York followed the Savannah, built in 1820, and then the wonder of the world. The Old Dominion Steamship Co. is an outgrowth of the Virginia Steamship Co., which had quite a prosperous business before the war. Two of the earliest vessels of the company were the Old Dominion and the Roanoke. It should be stated that the Roanoke illustrated in this article is a second Roanoke.

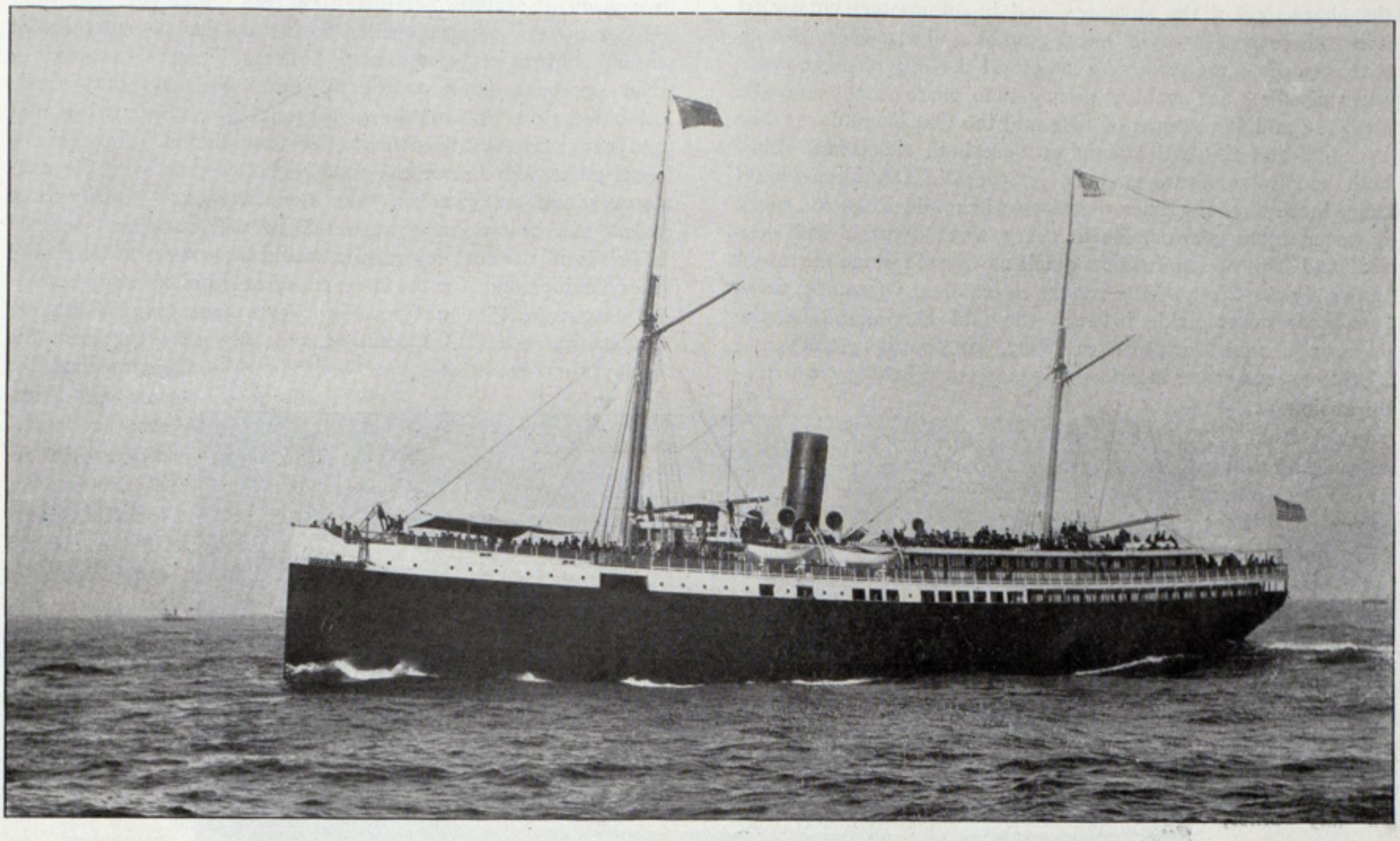
STEAM BRIG NEW YORK.

The first Roanoke was a side-wheeler of 1,050 tons register, with double beam engine. Her speed with fresh water in her boilers was 12 miles an hour, but she had no surface condenser, and when the water became salt and it became necessary to freshen up the water her speed would fall at once to about 10 miles an hour. Her consumption of coal was about 30 tons in twenty-four hours, and her time from New York to Norfolk varied from twenty-six to thirty hours. Of course, she had no modern improvements, that is, no steam windlass, steam capstan, steam steerers or steam hoisting engines. All the cargo was hoisted by hand or by horses. The company coaled up the ship in New York and a horse was taken on the deck of the ship to hoist the coal with. The strongest horse could not stand the strain for more than ten months. The Roanoke had accommodations for about 100 first-class passengers. The after part of her between decks was tak-



SIDE WHEEL STEAMER OLD DOMINION OF THE OLD DOMINION LINE.

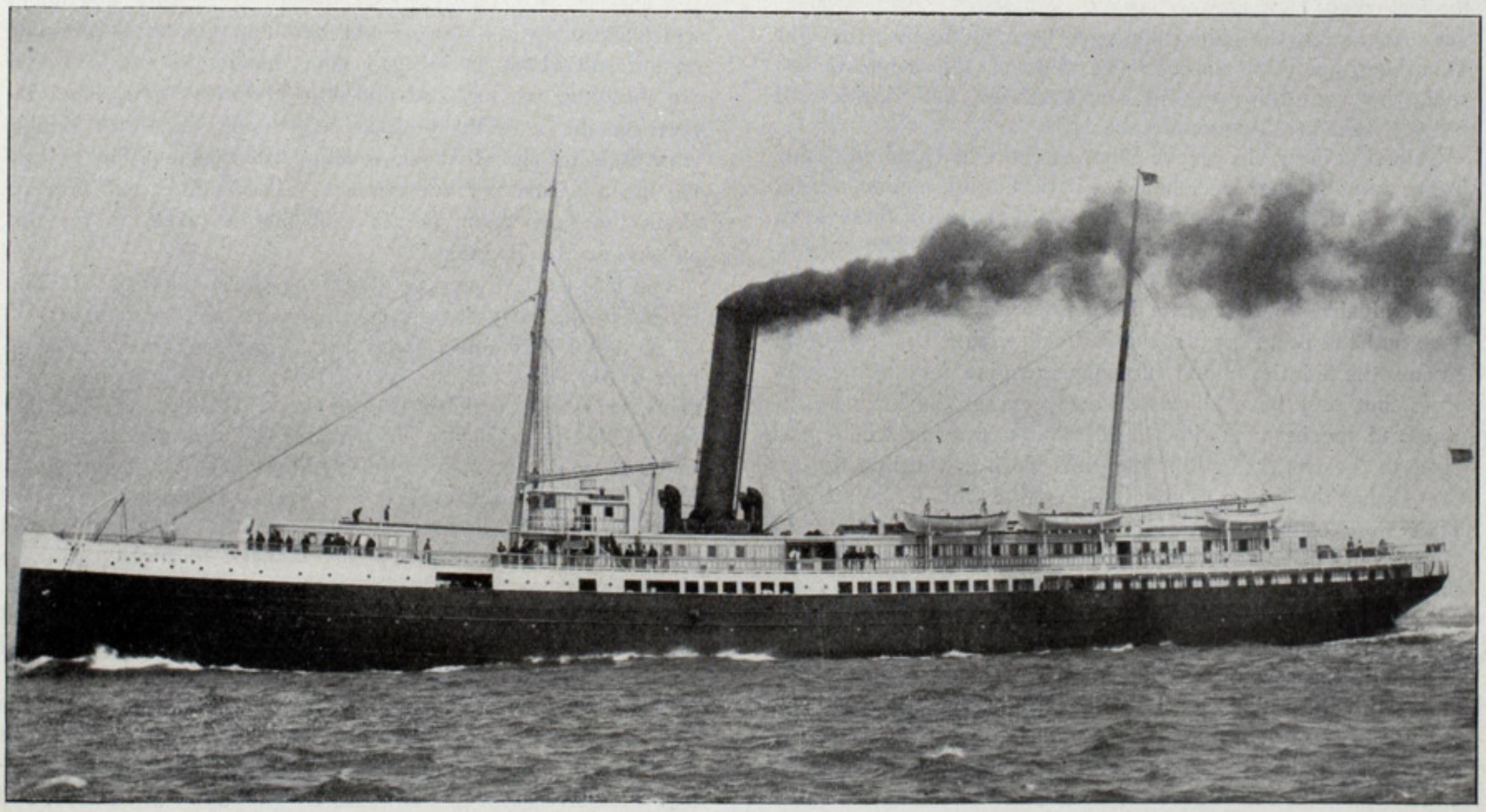
en for staterooms, for her cargo capacity was very small. She would not carry over 2,500 to 3,000 barrels. She had no side ports. All cargoes had to be hoisted on board over the promenade deck. The Jamestown was built a little later and was a trifle faster than the Roanoke. Subsequently in 1859 the Yorktown was built and added to the line. The Roanoke continued to run until the breaking out of the civil war in 1861 and was the last steamship to leave Richmond.



STEAMER ROANOKE OF THE OLD DOMINION LINE.

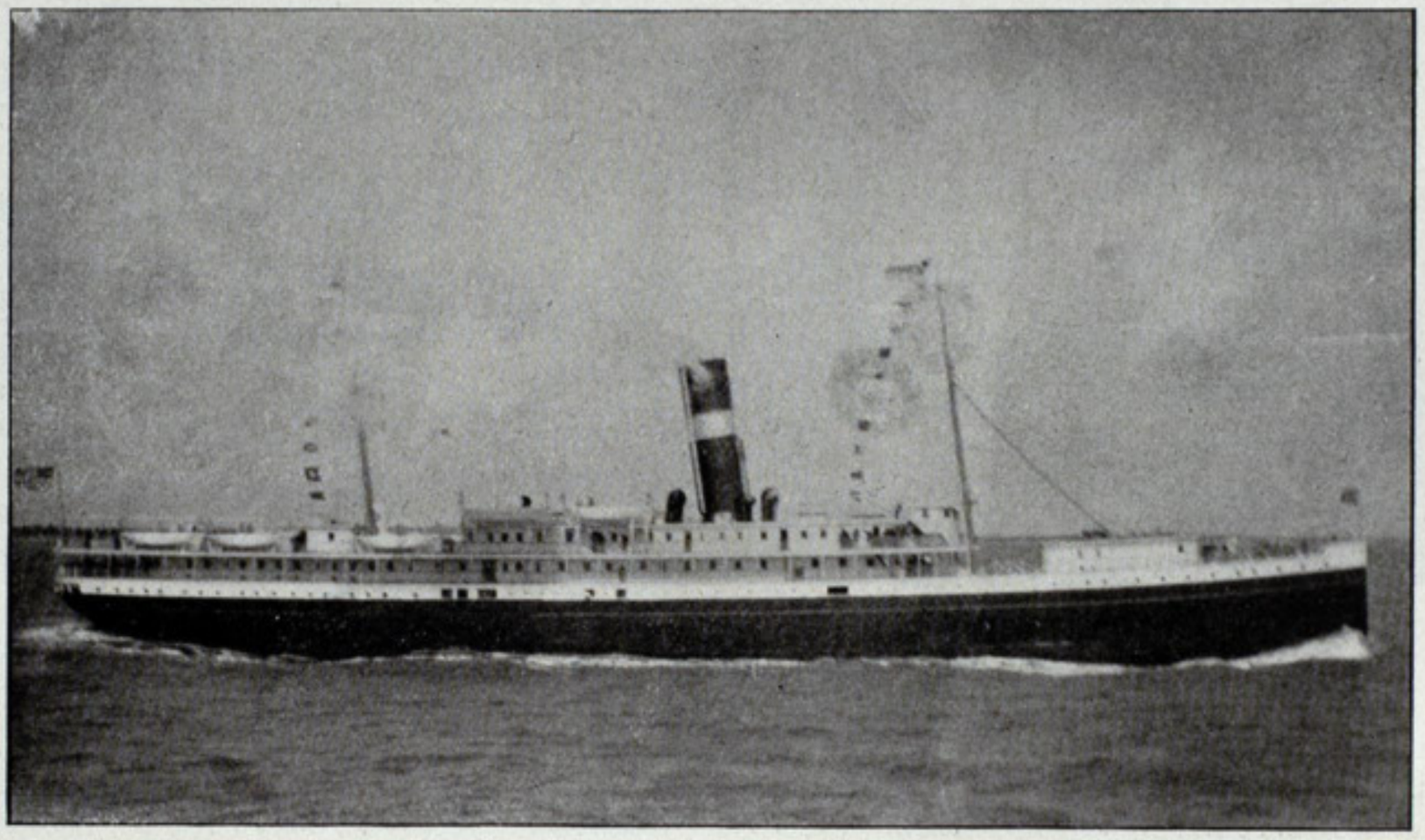
The Old Dominion, however, was the favorite side-wheeler of the company. The late Capt. C. W. Couch in speaking a few years ago of the career of the Old Dominion says that he considered her the best side-wheel ship that had ever been built in this country or any other. In an address at an annual dinner given by the Old Dominion Steamship Co. he said:

"In looking over the whole period of my steamship service



STEAMSHIP JAMESTOWN OF THE OLD DOMINION LINE.

and comparing the character of the vessels of 1854 with the character of the vessels at this time and the manner of doing the business, I am astonished at the rapid progress made in the characters of the steamers, and in all matters connected with the coastwise trade, but I cannot find anywhere during that period a more striking example of the difference in character of ships for making money than there is between the Roanoke and Jamestown of 1854 and the Old Dominion. The Roanoke and the Old Dominion were both side-wheel ships, both had low-pressure engines, yet the Old Dominion would carry more than six times the cargo of the old Roanoke, carry it faster, more comfortable in every way; carry it with less coal and load and unload as quick as the old Roanoke could with only one-sixth of the freight to handle. Of course, there is a very great stride between the Old Dominion and the Jamestown and Yorktown of today, but the Jamestown and Yorktown are screw steamers of finer model and have triple-expansion engines. But I regard the Old Dominion, which it has been my pleasure for so many years to command, as the very best side-wheel ship that has ever been built in this country or in any other, and I feel about as proud of her today as of any ship the company has in its service. I do not want you to feel that I am disparaging the ships that have been built since the Old Dominion, but with all deference to them, this company has today but two ships for all round service, both inside and outside, that are better than she is."



STEAMSHIP MONROE OF THE OLD DOMINION LINE

Chief Engineer George V. Sloat of the Old Dominion Line in speaking of the development of the marine engine during his career of half a century, says: "Necessarily there have been great changes and improvements in them. The surface condenser has been perfected, which I consider one of the most valuable improvements in engineering. In my time we have had the beam engine, the inclined engine, the horizontal engine, the side lever and the square engine for marine purposes, but they have all passed away except the inclined engine and the beam engine. The triple-expansion engine has come to the front. In 1851 the New York & Virginia Steamship Co.'s ships had a double beam engine with jet condenser. They were connected at right angles on the crank shaft, to pass centers in a heavy sea way. We had the flue boiler, and salt water to supply it. There was a consumption of 4½ lbs. of coal per hour per horse power. This large consumption was the result of three causes. The first was the low pressure of steam; the second was due to the overloading of the engines with the radial wheel and heavy dip, and the third was the use of the salt water for our boilers. In using salt water, we necessarily had to use a great deal of coal to heat the water and to blow out and reduce the density. The life of the boiler was about ten years, and during that interval we laid out an enormous sum for repairs. The surface condenser, perfected, changed all these conditions, and, taking the Isaac Bell as an illustration of the value of the surface condenser, saved our company many thousands of dollars. The Isaac Bell, after five years of service, because of the salt water that was used on her boilers, was compelled to lay up for two months, at an expenditure of $5,500 on her boilers. That is more money than has been spent on the Wyanoke and Old Dominion's combined time of forty-four years. Now sir, assuming that ten years was the life of the boiler (and that is a long time—eight years was nearer the time of boilers run with jet condensers and salt water), take the Wyanoke's twenty-three years; she would have worn out in that time two sets of boilers, and the cost for repairs would be $11,000 at least, and the combined sum for the two sets of new boilers and the outlays for repairs, would reach the enormous sum of $51,000, and taking the Old Dominion and Wyanoke together, the outlay for repairs and new boilers would have reached the sum of $102,000, and today they would require new boilers.

"This is the great value of the surface condenser. Really, without it, steam navigation would have been a failure. Now, we come to the compound engine on the Roanoke. We use 90 lbs. pressure, and we get a horse power with this machinery which consumes 2½ lbs. of coal per hour per horse power, a good result as far as we have gone, but in the new ships we are building, we have advanced to the triple-expansion, increasing the working pressure up to 180 lbs.—just double what it is on the Roanoke—making the consumption of coal 1¾ lbs. per hour per horse power. The engines will take up about the same room in the ship that is taken up for this purpose in the Roanoke."

The late Capt. Couch in describing the method of handling freight in the early days in contrast with later years said:

"A vessel that could carry 400 to 450 tons was loaded in four to six days. In the fall of the year, when business was brisk, we would load her in four days. Besides receiving the freight, the mate had to superintend the stowage, and it had to be stowed carefully in those old packets for, being small, they tumbled around badly. Wet freight could not be placed over dry, but we had to stow it so if the vessel rolled and pitched we would not have any damage to make claim on the underwriter for. The mate was the best paid man on the ship excepting the captain, and when I was mate I received $20 a month. These were the highest wages I ever had until I was master of a vessel.

"Now what were the profits in those days? Sailing vessels had a larger margin of profit then than it is possible for steamers to obtain now. The sailing vessels then that were well managed and handled earned from 15 to 25 per cent, and often paid for themselves in three or four years. What were the hardships in that service? Those of you who have not

been brought up on a sailing vessel know nothing of it. You go along this coast through good weather and bad, but you have a pilot house to shelter you. When we had to face the sleet and snow, the heat and the cold without much protection, and the exposure was terrific. I speak from experience as I have been through it. I have seen it so cold that in reefing the foresail I have frozen my fingers so quickly I did not know it until after the sail was hoisted.

"I have given you a brief outline of what it was in 1851. Let us come down to 1865. Then we had the steam and I took charge of a steamer, the Albemarle. She was between 800 and 900 tons. She would carry about 600 tons dead-weight. We had a master, two mates, and six sailors. We had to make a round trip to Richmond every week. She would steam about 10 miles an hour under the most favorable circumstances; with head wind about 6. It took us, in pleasant weather, about thirty hours to go to Norfolk. In bad weather, with a head wind, we got there as soon as we could; it might be thirty-six and it might be sixty-six hours. The compensation for officers varied but very little from what it does now. Masters received precisely the same (later, hard times compelled a reduction in master's wages). The chief engineer got the same as now; the first officer the same. Sailors the same as in 1851, $12 to $15 a month. Now they get $25.

"What were the net results? The margin of profit was much larger than it is today. Rates of freight were more than treble what they are now. We got 40 cents a hundred for heavy freight. We will carry all you give us if you will pay 12½ cents. For a hogshead of tobacco we usually got $6. I think we get $1 for some; I do not think we get over $1.50 for any. These were the rates then, and the only way we have been able to keep up against the steady decrease in rates is by improved machinery, better ships and better facilities.

"Now what are the hardships and trials, what the compensation today? I have already said that the officers were paid about the same as in '65. The sailors' wages are better. For the lower grades of officers and for manual labor the men are better paid. Then the quarters of the men were far less luxurious—were barely comfortable. The service was very much more severe and the demand upon the officers for care and attention much greater. The net profits in 1851 and 1865 were very much larger than today. The cost of transportation was more than double; the rates of freight more than treble. Yet the total expense of the force on shore, not including manual labor, is greater in proportion to the business done. The management on shore has not been so conservative as the management of the ships.

"I know I will be answered in this way; that this condition is unavoidable and the result of modern methods; that the reduced cost of handling the freight on the ships, and for moving the ships themselves, is attributable to a large degree to improved machinery. This, to a limited extent, is true; but has there been no improvement in the last thirty years in the methods of doing business on the land as well as on the water? What are the facilities for work in the office as compared with those of thirty years ago? In those days we had no shorthand writers. Envelopes had hardly been introduced, and printed forms were very little in use, excepting for bills of lading and manifests. If the head of the department wanted to communicate with any one across the city he had to write out his letter in long hand and send it by messenger. Now he simply turns to the telephone and talks with any part of the city, or to any part of the state, or to almost any part of the country. The cost of telegraphing has also been greatly reduced. We have every facility that inventive genius can devise, yet the proportional cost per ton of freight moved is largely increased, and this with modern methods which are, to my mind, often unnecessary and not gains."

In 1882 the company made a direct step forward by building the Roanoke, an iron screw vessel, sister to the Guyandotte.

The Jamestown was launched from Roach's shipyard in December, 1893. She is 310 ft. over all, 40 ft. beam, 26 ft. 9 in. depth of hold. She is schooner-rigged with two steel masts. The engine is of triple expansion condensing type, with cylinder diameters of 28, 44 and 73 in. by stroke of 54 in.; four steel boilers, 13 ft. 9 in. diameter and 12 ft. 6 in. long, allowed a working pressure of 180 lbs. supply of steam. She has accommodations for 100 first-class passengers, forty steerage and quarters and accommodation for twenty of the crew in the forecastle. Her sister, the Yorktown, was launched a month later.

In the spring of 1896 the Harlan & Hollingsworth Co. of Wilmington, Del., completed for the Old Dominion Co. the steamer Hampton Roads. She was 165 ft. long, 31 ft. beam over all and is equipped with triple-expansion engines with cylinders 12½, 20¾ and 33 in. diameter by stroke of 24 in. She has two Sloat boilers, 5.4 by 20.6 in size. She has plenty of freight and passenger capacity and is licensed to carry 574 persons. The freight department, engine room, officers' state rooms, smoking room and second cabin are on the main deck. On the hurricane deck are located the pilot house, the captain's stateroom and the life saving equipment.

The Princess Anne was launched from Roach's shipyard in 1897. She is 326 ft. in length over all, has a beam of 42 ft. and a depth of hold of 27¼ ft. She has three decks and four watertight bulkheads. Her tonnage is 3,078. Her upper main deck is built of steel, as is also her upper between decks. There are electric bells in all rooms. The craft has two steel pole masts designed to carry fore and aft sails, and one funnel, which is oval in shape, and 80 ft. tall from the grate bars. The saloon and cabins are wainscoted in red mahogany. The engines of the Princess Anne are of the triple-expansion condensed type, the cylinders being 27, 44½ and 73 in. in diameter by a common stroke of 54 in. Steam will be generated by four single-ended boilers, each 14 ft. 3 in. diameter and 12 ft. in length. The working pressure is 190 lbs. to the square inch. Propelling power is obtained from a single screw made of steel in one casting. The name of this ship, which is somewhat of a departure from the time-honored custom of the Old Dominion Co., is taken from the southeastermost county of the state of Virginia, and county town of the same name, 16 miles from Norfolk.

In the Princess Anne the Old Dominion Line has a good ship, without anything experimental about her, but with the most expensive joiner work and fittings. Her interior finishings are as fine and expensive as have ever been put in a ship, consisting almost entirely of mahogany, polished until it reflects like a mirror. She is considerably larger and finer in her appointments than the Jamestown and Yorktown, built at the same yard in 1894, for the Old Dominion Line, and which have held a leading place among American steamships.

The Old Dominion Line sold the steamer Roanoke in 1898 to the North American Transportation & Trading Co. She was built by Roach in 1882. The selling of the Roanoke was in conformance to a fixed policy of parting with the old vessels in order that their places might be taken by more modern products. In 1898 the Yorktown was sold to the United States government as an auxiliary cruiser. It is a curious coincidence that the first Yorktown was used as a war vessel, having been seized by the Confederates. The first Yorktown was a paddle-wheel steamer and was burned during the evacuation of Richmond. Immediately after the sale of these vessels the company placed orders for two new steamers of a class similar to the Princess Anne. They were named Hamilton and Jefferson.

LYRA, TREMONT AND MAINE.

The Maryland Steel Co., Sparrows Point, Md., have during the past three years constructed several magnificent freight carriers for the Boston Tow Boat Co. and the Atlantic Transport Co. They are splendid examples of the shipbuilder's art and represent the highest development of cargo carrier. Three examples, Lyra, Tremont and Maine, will do to illustrate them.

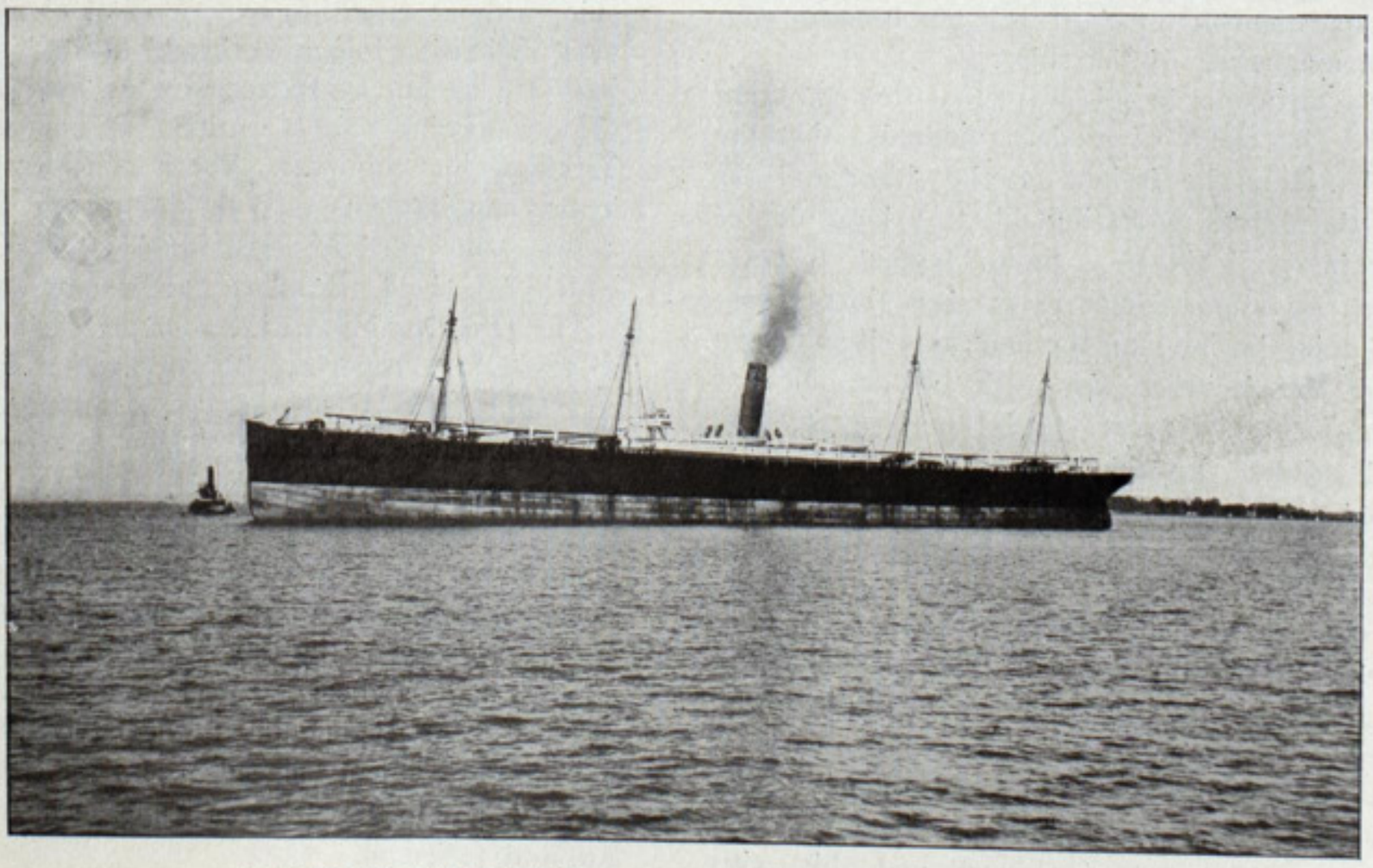
The Lyra was built for the Boston Tow Boat Co. in 1901. She is 350 ft. long over all, 330 ft. 6 in. between perpendiculars, 47 ft. molded beam, 35 ft. 6 in. depth at side to shelter deck; she has a hurricane deck, built to the American Bureau of Shipping classification. Her gross tonnage is 4,417, net 3,516. She has a double bottom for her full length. Her machinery consists of one triple-expansion engine with cylinders 21 in., 35 in. and 56 in. in diameter with a stroke of 42 in. Steam pressure 175 lbs. There are two Scotch boilers 14 ft. 6 in. in diameter by 10 ft. 9 in. long. The boat is at present engaged in the Pacific trade, running from Seattle to Asiatic ports.

THE LYRA OF THE BOSTON TOW BOAT CO.'S FLEET.
[*Built by Maryland Steel Co., Sparrows Point, Md.*

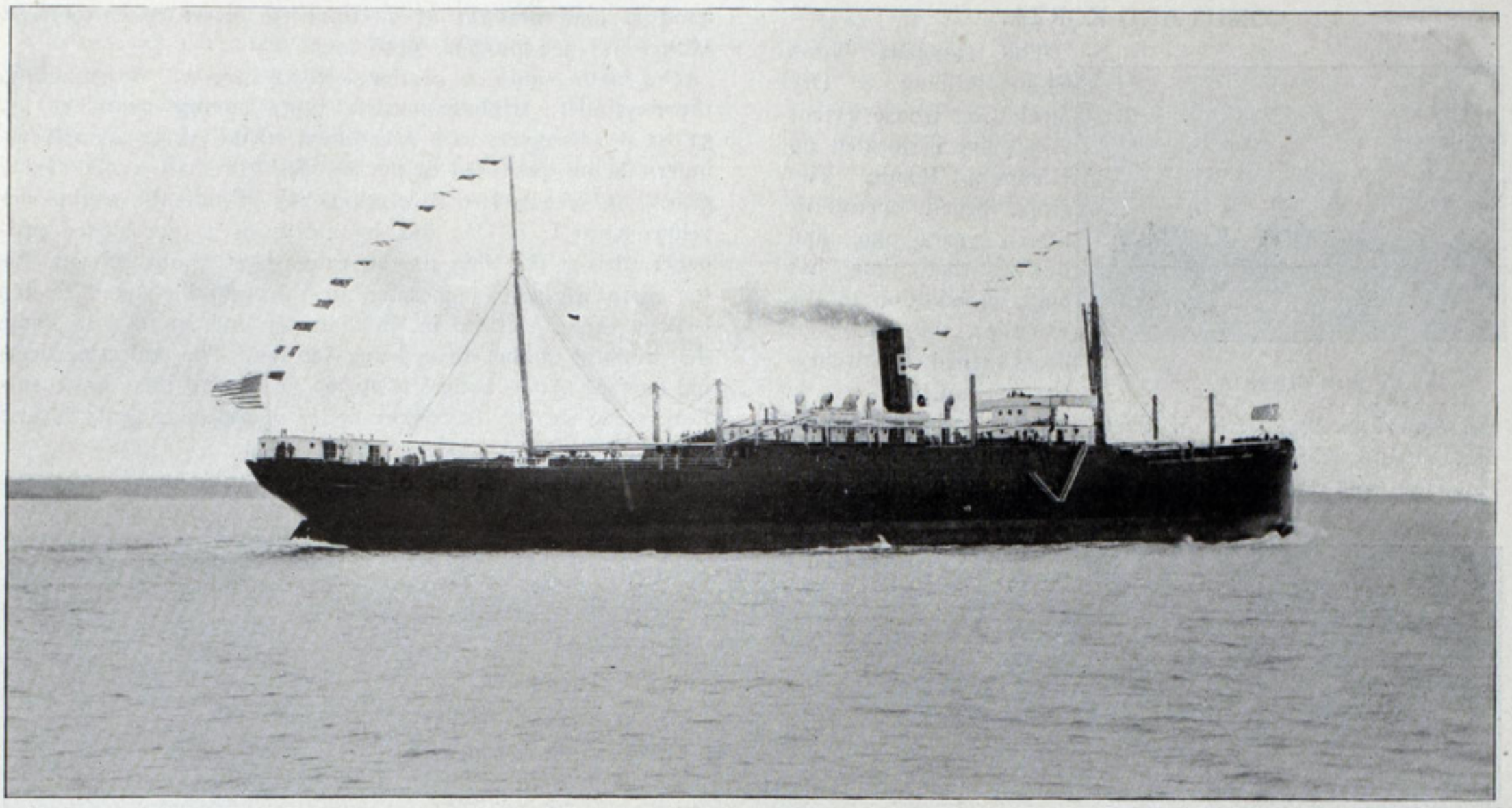
The Tremont was built for the Boston Steamship Co. in 1902. She is 505 ft. long over all, 488 ft. between perpendiculars, 58 ft. molded beam, 40 ft. depth at side to shelter deck. She is built to the British Corporation and the American Bureau of Shipping classifications. She has a shelter deck with long bridge deck amidships. Her gross tonnage is 9,606, net 6,195. Her machinery consists of two triple-expansion engines with cylinders 23½ in., 39¼ in. and 63 in. in diameter with a stroke of 45 in.; working pressure 200 lbs. She has four Scotch boilers 15 ft. 6 in. in diameter by 10 ft. 9 in. long and is fitted with Howden's forced draft. The boat is at present engaged in the Pacific trade, running from Seattle to Asiatic ports and has within the last year had passenger accommodations fitted to her.

The Maine was built for the Atlantic Transport Co. in 1903. She is 507 ft. long over all, 490 ft. between perpendiculars, 58 ft. molded beam, 43 ft. depth at side to shelter deck. She is built to Lloyd's Register of Shipping and the American Bureau of Shipping classifications. She is a three-deck vessel with a cattle superstructure amidships. Her gross tonnage is 7,914, net 5,077. Her machinery consists of two triple-expansion engines with cylinders 25 in., 42½ in. and 72 in. in diameter with a stroke of 48 in.; working pressure 200 lbs. She has four Scotch boilers 14 ft. 9 in. in diameter—two double ended 19 ft. 3 in. long and two single ended 10 ft. 6 in. long, fitted with Howden's forced draft. The boat is at present engaged in the North Atlantic trade between Baltimore and London, and in addition to carrying general freight she is fitted to carry about 750 head of cattle.

The very existence of these vessels is due to the fact that three years ago the promise of government aid to shipping was definitely made, and this encouraged the Boston Steamship Co. to build the two freighters which properly belong to the tramp class. In all the company has five of them in the Pacific trade. The promises of congress were not, however, borne out and the Tremont was fitted with passenger accommodations to enable her to extend the field of her



STEAMSHIP MAINE OF THE ATLANTIC TRANSPORT CO.'S FLEET.
[*Built by Maryland Steel Co., Sparrows Point, Md.*



THE TREMONT OF THE BOSTON STEAMSHIP CO.'S FLEET.

[*Built by the Maryland Steel Co., Sparrows Point Md.*

usefulness. She is now engaged jointly in the passenger and freight trade, sailing from northern Pacific ports.

ANNUAL MEETING OF CRAMPS

The annual meeting of the stockholders of the William Cramp & Sons Ship and Engine Building Co. was held last week in the offices of the company. The old board of directors was re-elected. The annual report showed a surplus after interest, etc., of $188,174, which compares with $179,198 last year. The financial report follows:

	1904.	1903.
Gross earnings	$7,107,082	$8,519,169
Profit over cost material, labor, etc.	735,031	696,497
Net, after general ex-interest, etc.	188,174	300,398
Dividends	.....	121,200
Surplus	188,174	179,198

The profit and loss account of the company as of April 30, 1904, shows: Gross from shipbuilding, $4,818,917; gross from other departments, $2,288,165; total gross, $7,107,082; operating expenses, $6,372,050; balance, $735,031; general miscellaneous expenses, $170,573; net profit, $564,457; income from other sources, including interest on deposits and discounts for cash on material bills, $25,608; total net profit, $590,066; fixed charges, interest, etc., $401,891; surplus, $188,174.

The president, Henry S. Grove, in his report, says:

"The income account for the year shows a net surplus from all the company's operations and interests of $188,174. But it must be borne in mind that under the terms of several of the mortgages against your property the conditions under which the $5,000,000 bonds were issued we are required to pay considerable money each year toward the liquidation of our indebtedness, and as we have no means of refunding these payments we must look to our earnings for the means of meeting them each year. It is, therefore, satisfactory to find that your net surplus for the year has been sufficient to enable us to meet these payments without encroaching on your working capital. The details of these repayments ($145,000) and of certain small improvements ($29,523)are charged to capital account. The past year indicates that there has been little or no profit in shipbuilding proper. Were it not for our subsidiary companies doing business other than that of building ships we would not be able to make this showing. Our position for the coming year, however, is secure in having in all departments contracts aggregating about $13,000,000 which is an increase over the same period of last year of $1,500,000."

After the stockholders' meeting the board of directors reorganized by electing the old officers.

THE FIRST STEAMBOAT.

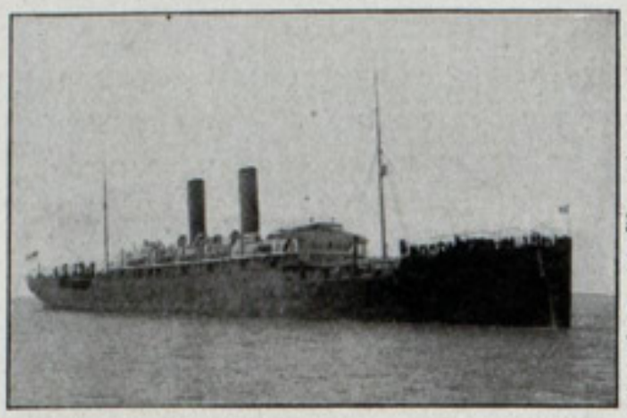
What was probably the first steamboat was built by John Fitch It was only 4 ft. long, and at first only had paddle-wheels. This was run in a pond near Davisville, Bucks County, Pa., in 1785. Five years later, 1790, he fitted a boat with steam-driven oars and ran it on the Delaware river, near Philadelphia. The construction was very crude and open to criticism, but the boat ran, and John Fitch deserves much more credit than he received from the world at large.

The navy department has announced that it does not see its way clear to construct the two colliers authorized by congress at the last session, to be constructed in government yards, since no appropriation was made for the construction of slips requisite to the work of constructing the ships. The colliers were designed to carry 5,000 tons of coal and to cost $1,250,000 each.

Thomas Riley, foot of Mechanic street, Buffalo, N. Y., launched last week a canal boat for George D. Gilson of New York, the first of three to be built at the Riley yard. The boat will be used in New York harbor to carry coal and grain for the Becker-Jones Milling Co. She is 100 ft. long, 18 ft. beam and 14 ft. deep. The hold of the bow is clear in order to enable her to be unloaded with clam-shells.

The Gilchrist Transportation Co. has begun the work of releasing the barge Hurona which was deposited in the lumber yard at Toledo by the January flood.

COMUS AND KOREA.



THE SIBERIA.

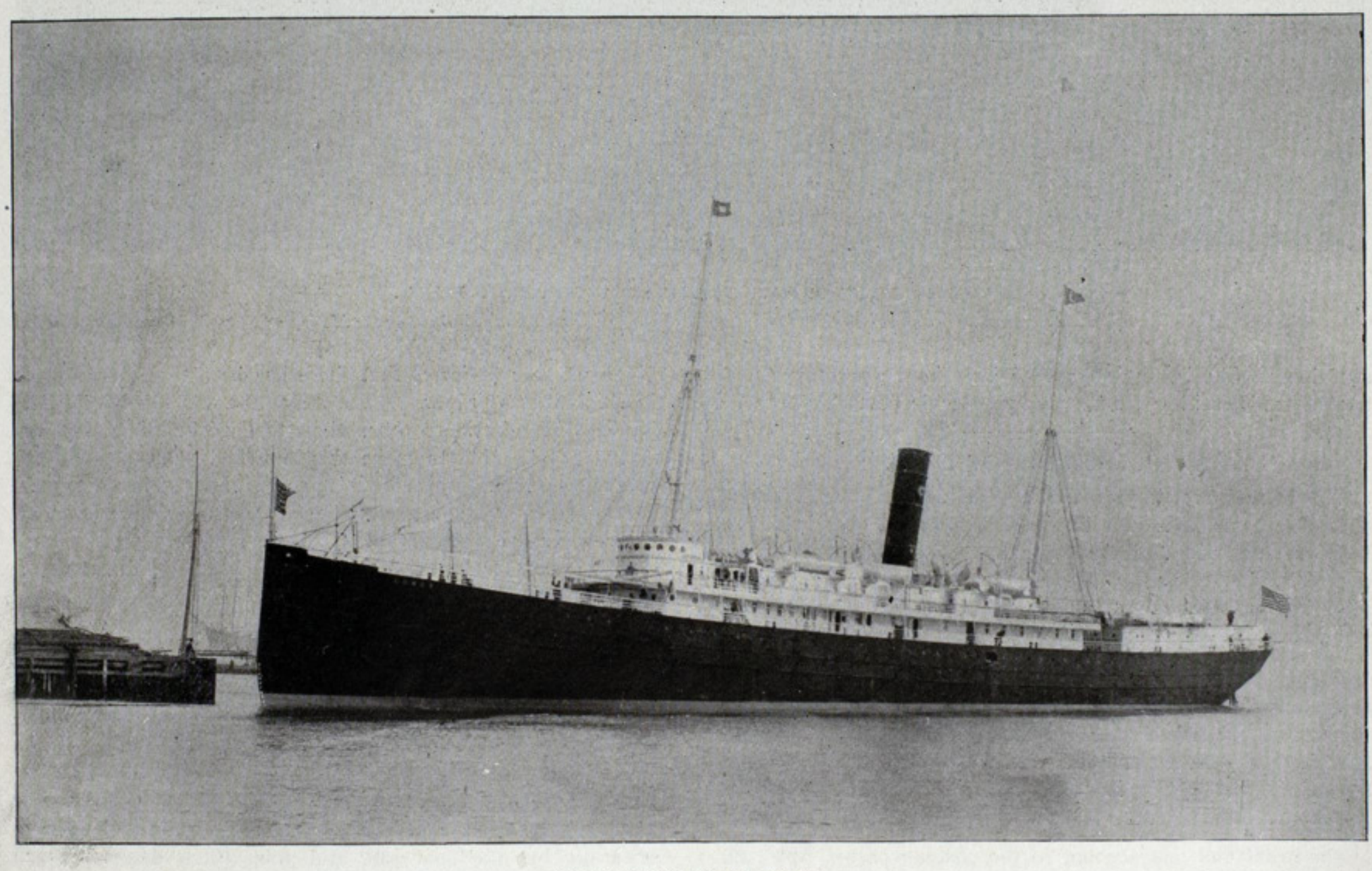
The Newport News Ship Building & Dry Dock Co., whose extensive plant is located on Hampton Roads, Virginia, began operations fifteen years ago, and during that time has built, in addition to the warships, tug and pilot boats turned out, twenty-two steamships to fly the American flag. All of these vessels, with the exception of the Korea and Siberia, now plying between San Francisco and Hong Kong in the Pacific Mail Line, were designed for coastwise trade. Four of the ships were purchased during the Spanish-American war by the United States government, and the others are still in service. Of the twenty-two steamers built, twelve were for the Southern Pacific Co.'s Morgan Line and three for the Cromwell Line. In essential particulars these ships are alike, being modern in construction and embracing the latest practice in ship building, and for the purpose of showing the development of the deep-sea freight carrier in the United States in recent years at Newport News, perhaps brief descriptions of the Cromwell liner Comus and the Pacific Mail liner Korea will best serve.

The Comus, built in 1899, at a cost of about $600,000, was designed for express freight and passenger service between New York and New Orleans. She is of the hurricane deck coasting type, with two pole masts, and has the following characteristics: Length between perpendiculars, 379 ft. 9 in.; beam, molded, 48 ft.; depth, molded, 33 ft. 9 in.; displacement at load draught of 22 ft., 7,350 tons; gross tonnage, 4,825 tons; net tonnage, 3,000 tons.

The main engine is of the vertical, inverted, direct-acting, three-cylinder, triple-expansion type, having cylinders 33, 52, 84 in. diameter, with a common stroke of 54 in., all cylinders being provided with the See-Marshall radial valve gear. At seventy-two revolutions per minute the engine develops 4,040 I. H. P., and, by means of a four-bladed propeller, drives the ship at the rate of 15 knots. Steam for the main engine is generated in three double-ended Scotch boilers, each 13 ft. 10 in. in diameter and 20 ft. 6 in. long, the pressure of the steam being 180 lbs. The collective heating surface of the boilers is 10,365 sq. ft. and their grate surface is 429 sq. ft. A donkey boiler of ample capacity is also provided.

The Comus is capable of carrying 250,000 cu. ft. of cargo in conjunction with a normal coal supply of 520 tons; but by sacrificing some of the cargo space, 960 tons of coal may be stowed. Water ballast of fresh water to the extent of 660 tons may be carried in the peak tanks. The passenger accommodations include twenty-six staterooms on the hurricane deck, eight staterooms on the promenade deck, a dining saloon on the hurricane deck, seating fifty-eight persons, a social hall and a smoking room on the promenade deck. Besides these first-class accommodations provision is made for sixty-six male and sixty-six female steerage passengers, and fifty-four more steerage passengers may be berthed on the main deck aft, when occasion demands. To provide against sinking in the event of collision, four complete transverse watertight bulkheads running up to the main deck are provided, besides others up to the lower deck.

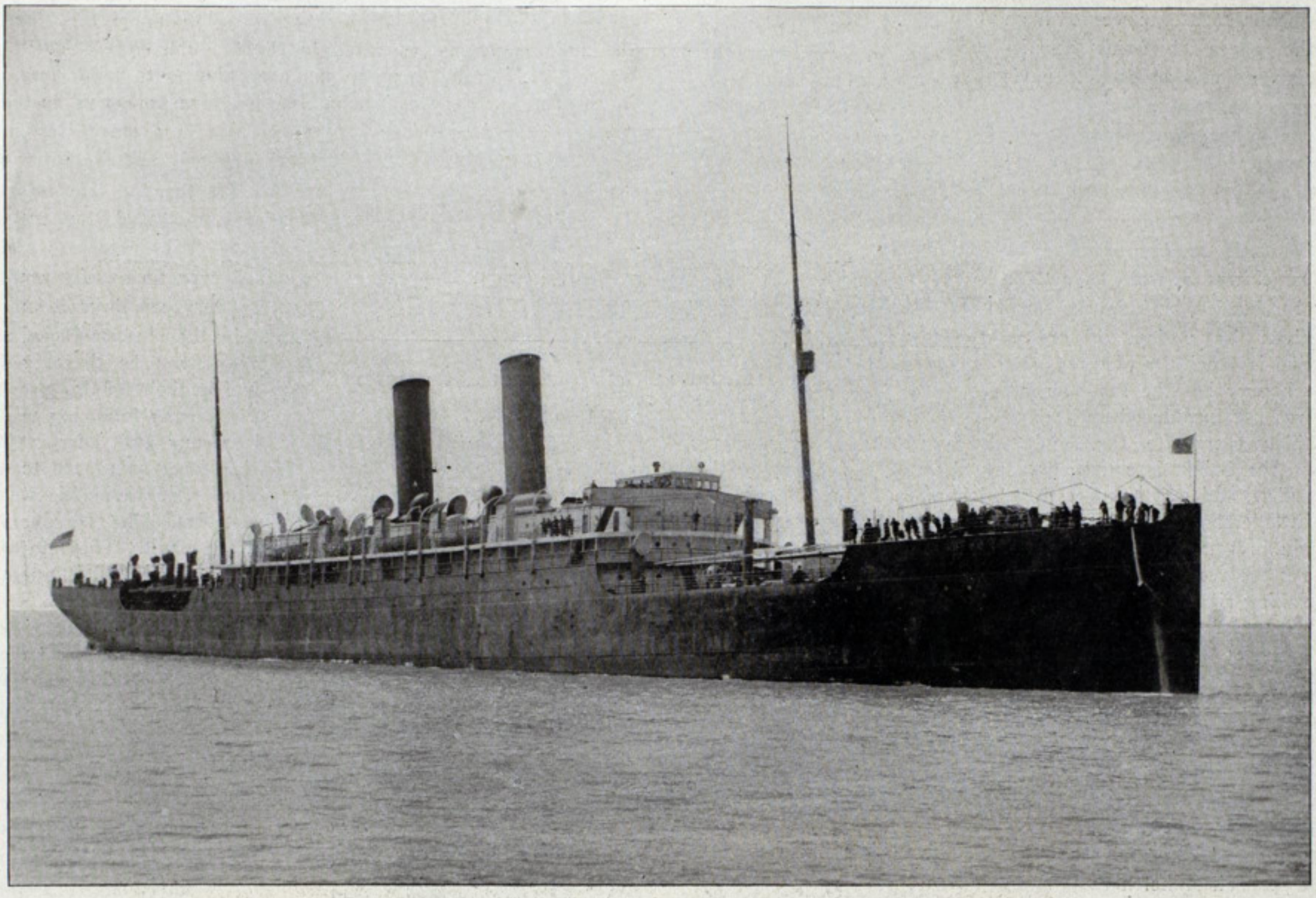
At the time of her completion in 1902 the Korea, which cost nearly $2,000,000, was the largest steamship ever built in the United States, and she represents the highest type



CROMWELL LINER COMUS.

[Built by Newport News Ship Building & Dry Dock Co., Newport News, Va.

of the modern ocean passenger, mail and freight carrier. The Korea and her sistership Siberia, also built at Newport News, are the largest vessels engaged in the Pacific trade and they have broken all records for fast time. The general characteristics of the Korea are as follows: Length over all, 572 ft. 4 in.; length between perpendiculars, 550 ft.; molded breadth, 63 ft.; depth of hold, 21.8 ft.; total depth at center, 41 ft. 10 in.; displacement at load draft of 27 ft., 18,400 tons; gross tonnage 11,284; net tonnage, 5,655.



THE KOREA, OF THE PACIFIC MAIL STEAMSHIP CO.'S FLEET.

[*Built by Newport News Ship Building & Dry Dock Co., Newport News, Va.*

There are two four-cylinder, vertical inverted quadruple-expansion engines, the cylinders being 35, 50, 70 and 100 in. in diameter by 66 in. stroke. At eighty-six revolutions per minute the engines developed over 17,500 I. H. P., giving the ship a speed of over 18 knots an hour. The best speed made by the Korea on her trial was slightly over 20 knots. There are two propeller wheels, of manganese bronze, each wheel having three blades and being 19½ ft. in diameter by 25 ft. pitch.

The main steam boilers, which consist of six double end and two single end, are of the Scotch type. They are arranged in two separate compartments, three double and two single end being in the after compartment and three double end in the forward compartment. The double end are each 16 ft. in diameter and 20 ft. 3 in. long, each having 6,419 sq. ft. of heating surface. The single end boilers are each 16 ft. in diameter by 10 ft. 5 in. long, and each has 3,208 sq. ft. of heating surface and 76 ft. of grate surface. There are twelve Morrison corrugated furnaces installed in these boilers. The forced draft system, which is on the closed stoke hold principle, consists of thirteen 60-in. blowers.

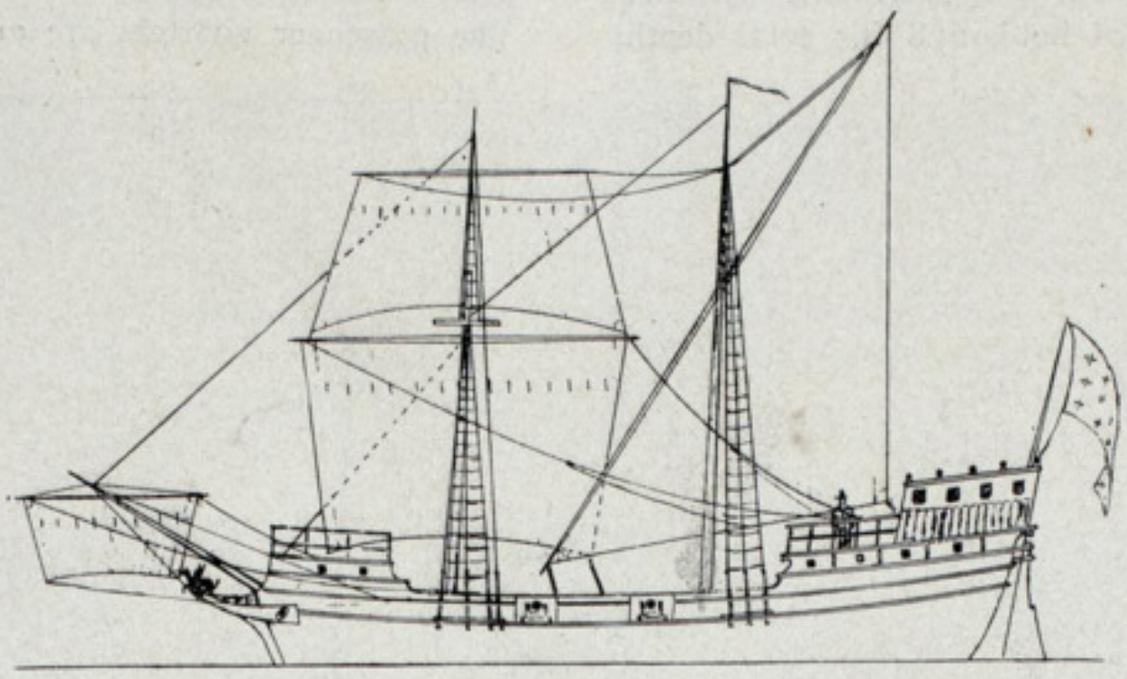
The cargo and coal capacities are both large. The Korea is capable of carrying 510,466 ft. of cargo and a coal supply of 2,583 tons. Four of the coal bunkers are so arranged that they may be used either for coal or cargo. Machinery for handling the cargo is of the very latest pattern.

Accommodations are furnished for 200 first-class passengers and 1,200 Chinese in steerage. The first-class passengers are accommodated on the promenade and upper decks. The passenger quarters are arranged on the starboard side, and the galleys, pantries and quarters for servants and crew, together with the entrances to boiler and engine rooms, on the port side, with no passage across the vessel. The first-class staterooms are trimmed in cherry and white, with furnishings to match, everything being modern and convenient. The social hall, which is on the promenade deck, forward, has a floor of slate with rubber tile, the wainscoting being of mahogany and the upholstering of red plush. The double stairway leading from the social hall to the dining room saloon below is of solid bronze, with ornamental railings and newel posts. The dining saloon has a seating capacity of 202 and the prevailing decorative colors are olive green, white and gold. The light well is surmounted by a glass dome or arched sky-light, made of leaded glass, a floral design of olive green being set in a ground of opalescent glass. At night this dome is illuminated from without by electric lights. For the comfort of the passengers there is a complete system of ventilation, especially designed for travel in semi-tropical waters.

T. F. Manville, president of H. W. Johns-Manville Co., New York, E. B. Hatch, president of Johns-Pratt Co., Hartford, and J. W. Perry, manager of the electrical department of the former company, sailed for England last week and will return about June 10.

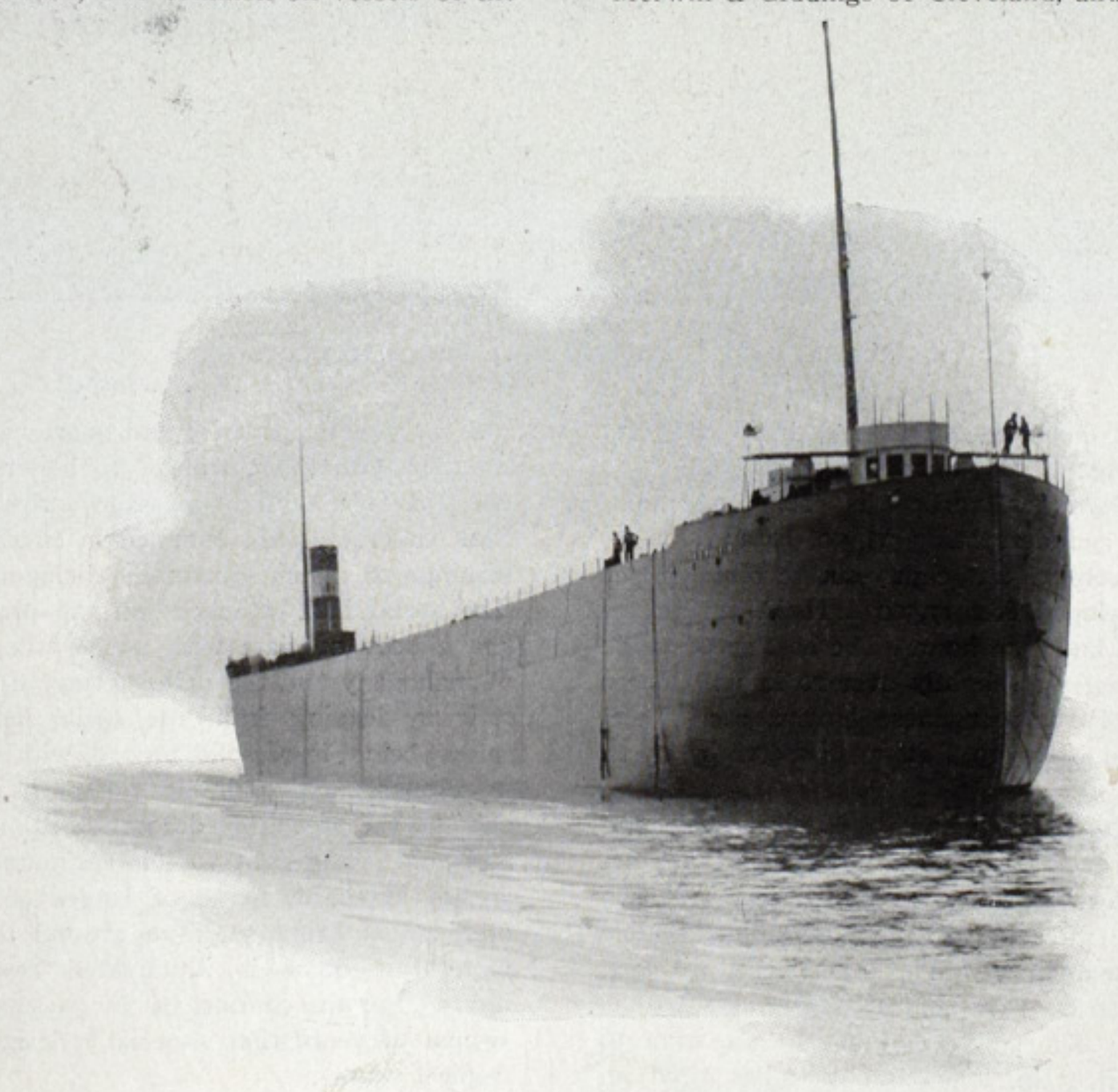
Freight Carriers of the Great Lakes.

It is not in dispute that the Griffin was the first cargo carrier on the great lakes. Cavalier de La Salle, the French explorer, built the Griffin in May, 1679. He landed at the mouth of the Niagara river on the spot now known as Fort Niagara in December, 1678. He secured from the Seneca chieftains permission to build a vessel to navigate the inland waters. The site of the construction of the vessel has been located as nearly as possible on the farm of Jackson Angvine close to the little Niagara river. The vessel was between 45 and 60 tons burden, both figures being given by various historians. She is fancifully pictured as a schooner but the schooner rig was not introduced until about thirty years after the Griffin was launched. The correct rig on the Griffin is conveyed in the drawing accompanying this article, and was discovered by Richard P. Joy of Detroit in a little leather covered French book published by Father Hennepin in 1711. It is probable that La Salle obtained a design for the vessel when in France and that her rig was the prevailing rig of vessels of that period. On her main masts the triangular lateen sail was used then universally, and on the foremast the two square sails, also common on vessels of the time. As the triangular jig or staysail did not come into use until the early part of the eighteenth century, it is probable that the Griffin carried a spritsail on her high bowsprit. Even as late as the year 1750 the spritsail was common to all sea-going vessels.



CORRECT RIG OF THE GRIFFIN, FIRST FREIGHTER OF THE GREAT LAKES.

The Griffin is the first mystery of the great lakes. She sailed out of the Niagara river on August 7, 1679, under command of La Salle. The vessel was navigated by an old salt water seaman who acted as pilot and in four days the Detroit river was entered and along its banks the members of the ship company killed bear, deer and game. The Griffin reached Mackinac in good season. After a short stay at Mackinac she set sail for Green Bay and took on a cargo of furs at one of the islands there. On Sept. 18, 1679, she began her return voyage for the Niagara river in charge of the pilot. La Salle and his company remaining behind, explored the Illinois river. This was the last seen of the Griffin and her ship's company, for she was never heard from again and her fate remains even to this day shrouded in mystery.



THE AUGUSTUS B. WOLVIN, THE LATEST AND LARGEST FREIGHTER ON THE GREAT LAKES.

Broadly speaking it is true that for more than 100 years thereafter no attempt was made to navigate the great lakes. Then commerce began to be carried on in a small way in sailing vessels on Lake Ontario which was the first lake to be generally navigated. The navigation of Lake Superior was confined even up to fifty years ago to very small craft employed by the Hudson Bay Co. As far as can be discovered they had in their employ previous to 1829 the following vessels: the Vincible, Otter, Mink, Recovery and Discovery. These were schooners carrying in size from 20 to 100 tons burden and all built on Lake Superior. The Invincible was wrecked on White Fish Point about 1822. The Discovery went to pieces running the rapids at the Sault. The fate of the Otter is unknown. The Mink went ashore on the Canadian side about the rapids and was entombed there. The Recovery safely ran the rapids in 1829 and was purchased by Merwin & Giddings of Cleveland, and ended its days in Lake Erie. During the six years that followed 1829 the only vessels that navigated the waters of Lake Superior were batteaux and bark canoes. In 1835 George W. Jones built about the Sault a schooner of 130 tons burden and named her John Jacob Astor. She made her first voyage in August of that year under command of Capt. Charles C. Stannard, who discovered Stannard Rock on his first trip in the Astor. The Astor was followed by the schooner William Brewster. The schooner Algonquin of 50 tons burden was hauled over the Portage in Sault Ste. Marie in 1839 and made her first trip on Lake Superior in the spring of 1840. She was commanded by Capt. John McKay, father of George P. McKay, the present treasurer of the Lake Carriers' Association. The schooner Madeline, belonging to the American Fur Co., was built at La Pointe in 1837. The schooner Siscowit was also built at La

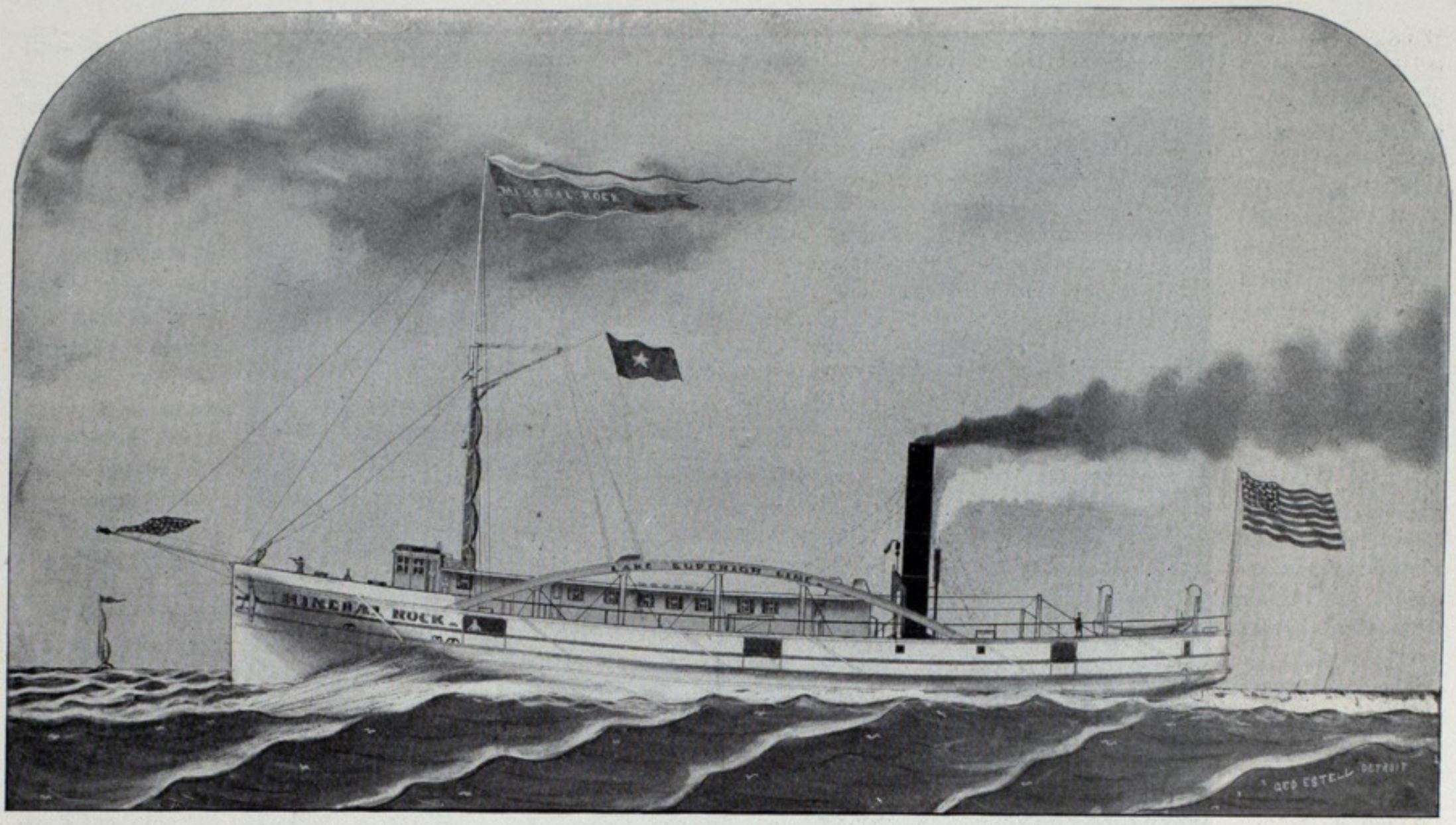
Pointe. In 1845 the schooner Chippewa, 20 tons, the schooner Florence, 20 tons, were hauled over the Sault Portage into Lake Superior. Following them was the schooner Swallow of 80 tons burden, then regarded as a monster. She was regarded as too large for Lake Superior and was sent to the lower lakes. Later the schooners Merchant and Uncle Tom were hauled over.

The first steamer to ply the waters of Lake Superior was the propeller Independent. She was full-rigged like a ship and had a powerful steam engine, but she was always in trouble. Neither wind nor steam could make her go. The first trip of the Independence on Lake Superior, as well as the conditions obtaining at that time are well told by Mr. Lewis Marvill of Parksville, St. Joseph County, Mich., who was a member of the crew of the Independence. He states:

TUGS WAITING TO HELP VESSELS INTO HARBOR.

"My memory carries me back to the spring of 1845, or more than one-half of a century, and I have a vivid recollection of standing on Dorr & Webb's dock, in Detroit, early in the spring watching the process of transforming a little tub of a sloop of about 15 tons, into a fore-and-after, called the Ocean. My funds being rather low I determined to ship if I could, and ship I did. We took in a cargo of fish for Sandusky and Milan, O., and in due time sailed for these ports, and returned without any mishaps. We then received orders to fit up for Lake Superior, which we accordingly did, but being slightly indisposed when we got ready, I could not proceed with the vessel, which sailed without me. Some time in June, the same firm that owned the Ocean bought and fitted up the topsail schooner Merchant of about 75 tons, Capt. John Watson, for the same trade, i. e., Lake Superior, and I being determined to visit that famous lake, shipped on her, with the understanding that I might join my own ship (the Ocean) at the Sault if I felt so disposed. In due time we took on board all the necessary materials for taking both vessels, the Ocean and Merchant, over the rapids and reached the Sault, where we found the Ocean waiting for us. We fell to and worked her over in short meter, and then tackled the larger one, the Merchant. They were taken over on rollers the same as buildings are sometimes moved. When we had her about half way across, word came that a steamer had just arrived from Chicago, with all the rigging on board, to be taken over the rapids. A few days after a misunderstanding arose among the crew of the Merchant, and a part of them quit and left her. Hearing that they were in want of a porter on board the newly arrived steamer Independence, then lying at McKnight's dock getting ready to be hauled over, I applied and got the berth of porter and immediately began my duties as such.

"Everything being in readiness the ship was hauled out of the water, and began its transit across the neck of land forming the rapids. No mishaps occurring, the progress of hauling progressed slowly but surely, and in about seven weeks we were again launched in the river at the head of the falls. In the meantime the schooner Napoleon of about 150 tons, was being put together (her whole works having been got out and shipped there already) and she was launched a short time before the Independence, and so was the Merchant, she having stuck in the process of launching, which caused considerable delay. By this time it had got to be quite late in the fall and it began to be feared that we would not be able to make the trip before we were frozen in. But finally we got away with a crew of fourteen men and steamed up the lake. The first place we touched at was Copper Harbor, or Fort Wilkins (no such place as Marquette then being thought of), where we found a small garrison and two or three log huts. The next in order was Eagle Harbor, where there were a few prospectors, and then on to Eagle river, where we discharged the most of our cargo, but before we could throw off some fifty kegs of powder the wind raised from the northwest and kicked up such a sea that we had to weigh anchor and leave. We shaped our course for La Pointe but made very poor headway, the wind being almost ahead. We, however, persevered till we got within sight of the Apostle Islands, when the wind freshened into a gale and we had to turn about and run before it and make for the lee of Keweenaw point, the nearest harbor that we dare enter with safety. In the meantime the seas got running so high that it tossed our little steamer like a shell and rolled so heavy that the stoves broke loose from their moorings and tumbled all over the floor. When it is remembered that it



THE MINERAL ROCK—A TYPE OF 1856.

was not generally known among passengers and crew that we had fifty kegs of powder aboard it made rather lively work for us straightening things up. We succeeded in reaching our objective point in safety, where we cast anchor and laid by for three or four days waiting for weather, repairing and laying up a stock of wood, which we had to chop and take off in our yawl, rather slow but sure work. We again set sail, and this time having favorable weather, we succeeded in reaching Eagle river where we bid good-bye to our dangerous cargo (powder), and where some of us strolled up the Cliff mine and there saw the first stamp mill (rather a primitive one) in operation in that now famous region. Returning on board we again steamed up the lake to La Pointe, our final destination (no such place as Ontonagon then being thought of), which we reached in safety, and gave the natives a dreadful scare with the appearance of our craft and the noise of our steam whistle.

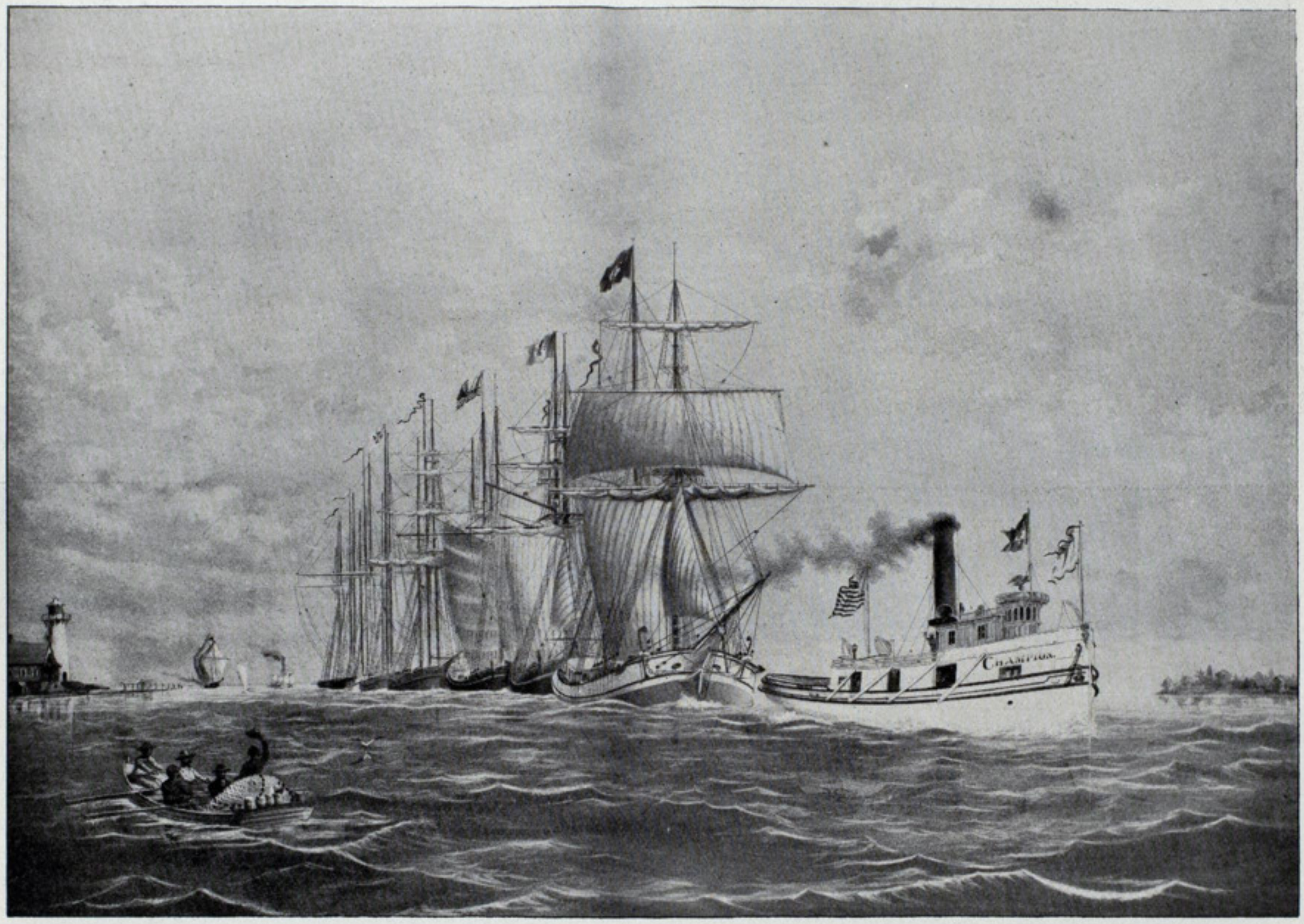
"Our trip up the lake being now accomplished, we started on our return to the Sault, which we reached in safety. The season being now far advanced, we immediately proceeded to dismantle the steamer and laid her up for the winter, in company with the following named crafts, which then constituted the available fleet of the greatest of the great lakes: The Ocean, about 15 tons; Chippewa, about 20 tons; Algonquin, about 30 tons; Swallow, about 40 tons; Merchant, about 75 tons; Napoleon, about 150 tons; and the Independence, about 365 tons, the first steamer that ever ploughed Lake Superior. Thus ended that memorial first day trip by steam to the mining regions. We found below the falls the steamer Baltimore, which was either hauled over in the winter or early spring. The Napoleon was fitted up the next summer with engines."

Such were the conditions existing on the greatest body of fresh water in the world prior to the construction of the Sault Ste. Marie canal in 1855. The first steamer to pass through the canal was the Illinois. She was followed by the North Star, which was a very swift steamer and which beat the Illinois into Marquette, then the only village of any importance in the upper peninsula of Michigan. Other steamers to follow were the General Taylor, Northerner and Mineral Rock. The illustration of the Mineral Rock accompanying this article will give a very good idea of the character of these early steamers. The steamers were designed for passenger and packet freight and that is the reason why nearly all the early cargoes of ore were carried by schooners. The steamers had no means of carrying it except on deck where it of course made a dreadful litter. Accompanying this article is a general view of the harbor of Marquette taken in 1860, showing a number of schooners in the harbor waiting for cargoes of iron ore. Marquette was at that time the only iron ore shipping port of the great lakes and the photograph gives an excellent representation of the character of vessels engaged in this trade at that time. A dock had been constructed at Marquette whereby the vessels might be loaded on the gravity system. It was the forerunner of the present enormous docks with 50-ton pockets and loading chutes. Of course, the dock was of limited storage capacity, but the principle of pockets and chutes was the same. The steamers of these early days were not especially adapted to this form of loading device as they were higher out of the water than the schooners and the chutes did not have the pitch to make the ore flow into them as easily as it did into the schooners.

The ore trade, of course, has been since Lake Superior became commercially navigated the dominant trade of the great lakes and vessels have been gradually designed to accommodate it. The history of the ore trade, therefore embraces the history of the freight carriers on the great lakes as the term is generally understood in that region. No attention will be paid in this article to the great side-wheelers which plied the great lakes in the 40's and 50's because they were essentially passenger steamers. They were both numerous and magnificent and did a profitable business between Buffalo and Chicago and intermediate points until the railway was developed when the through passenger trade, via the lakes, gradually fell off.

The average ore cargo carried by such propellers as the Northerner, Gen. Taylor, Mineral Rock, was not much over 300 or 400 tons, and it was very gradual, indeed, that their car-

rying capacity was increased. In 1861 the system of transportation in barges was first introduced on the lakes. It was used at first in the lumber trade, but was extended to other branches and it was quite a common sight to see four, five or six barges towed by propellers or tugs. This system flourished for a decade. About 1870, however, it began to be superseded by the system of the propeller and its consort, which, owing to the greater convenience of handling a dock, finally became the settled system of bulk cargo carriage on the great lakes. Indeed, it is only within the past few years that this system may be said to have lost its popularity, although as there are many barges yet on the lakes it still cuts a considerable figure in the trade. However, as far as new construction is concerned, the single steamer preponderates nowadays.

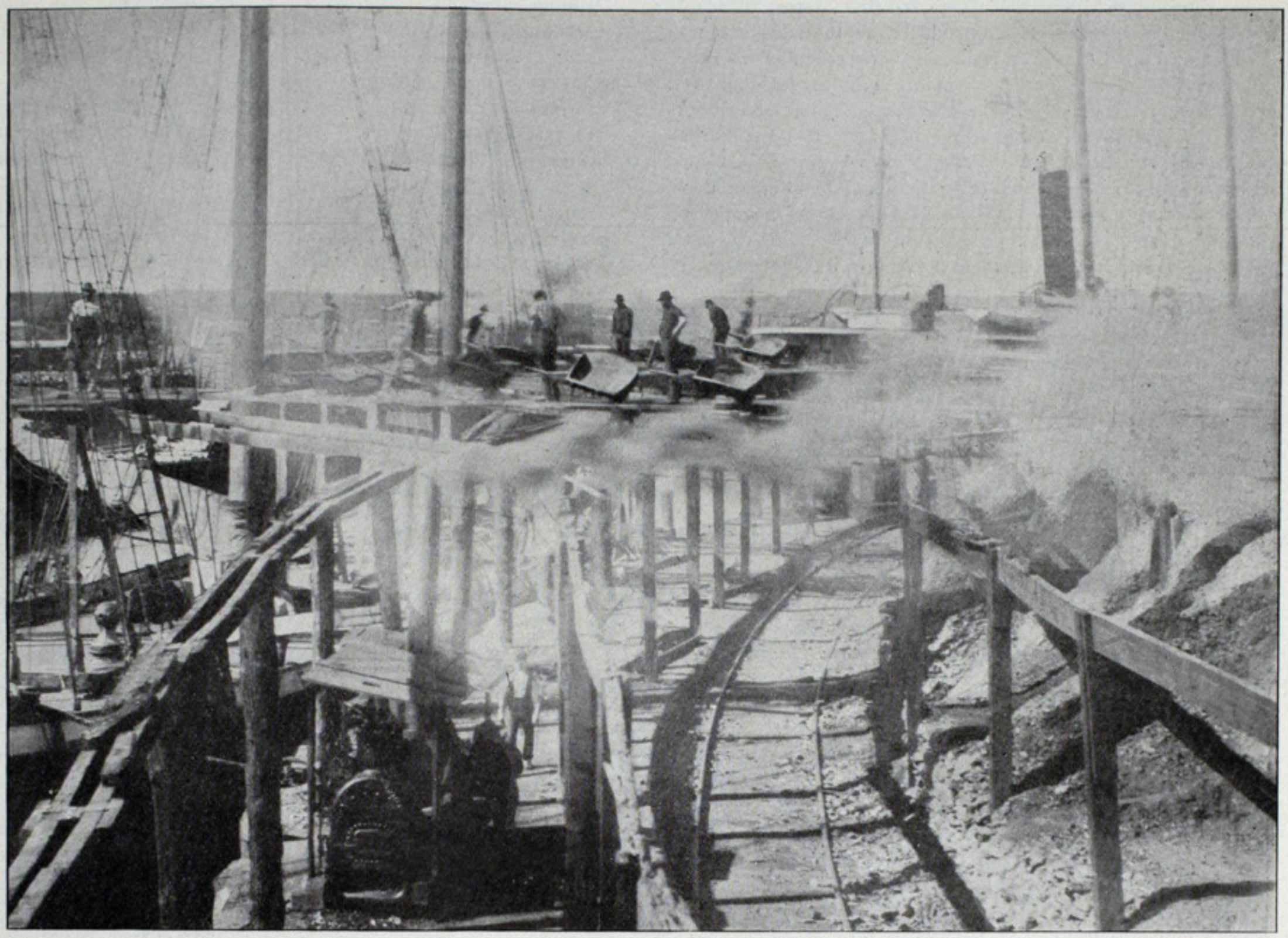


THE TUG AND ITS TOWS—A METHOD OF TRANSPORTATION NO LONGER IN VOGUE.

The steamer R. J. Hackett, built in 1869, and the Forest City, built in 1870, to carry the ore of the Jackson mine, were the first steamers built exclusively for the ore trade, and are the forerunners of the present mighty fleet upon the great lakes. They were constructed by Peck & Masters of Cleveland and had a carrying capacity of from 1,200 to 1,300 tons of ore. They were the first steamers to have continuous holds with hatches spaced 24-ft. centers and machinery aft, and are the parents, indeed, of a very numerous but much improved family. The Hackett was 211 ft. long and 32 ft. beam and the Forest City was 213 ft. long and 33 ft. beam. Three years later the steamer V. H. Ketchum, 20 ft. longer than either the Forest City or the Hackett, was built and she was regarded as a monster. She was, in fact, far in advance of dock facilities.

It may be said that for eight years thereafter there followed nothing more interesting as far as the ore carrier was concerned than the duplication of type. While David Bell of Buffalo had in 1861 built for Edwin Evans of the Anchor Line an iron propeller for the packaeg freight service, no attempt was made until 1882 to utilize this material for the construction of carriers. The propeller built by Bell was named the Merchant and was 190 ft. long, 29 ft. beam and 14 ft. hold. She ran a fairly successful career for about twenty years. In 1882, however, the Globe Iron Works of Cleveland built the Onoko, which was the first iron steamer constructed for the ore trade. The Onoko was 287 ft. long and 38 ft. beam and was immediately successful. She was the largest dead-weight carrier on the great lakes for many years.

Vessel men then began to see the advantages of steel for ship construction, owing to its longer life and greater toughness, and its use has been extended so generally since then that it is now practically the only material used for vessel construction on the lakes. While there have been vast improvements in the construction of steamers for the ore trade, there has been practically no departure, save one, from the prevailing type. This one great departure was made in 1888, when Alex. McDougall of Duluth conceived the form of construction known as the whaleback. The first of these was known as No. 101. The two ends for this steamer were constructed by the Pusey & Jones Co., Wilmington, Del. The steel ends, each about 30 ft. long, were built by the Pusey & Jones Co., in their ship yard in 1887. They were taken down, each piece carefully marked, and shipped to the head of the lakes, where their men erected and connected them to the body of the steamer, which was then building. No 101

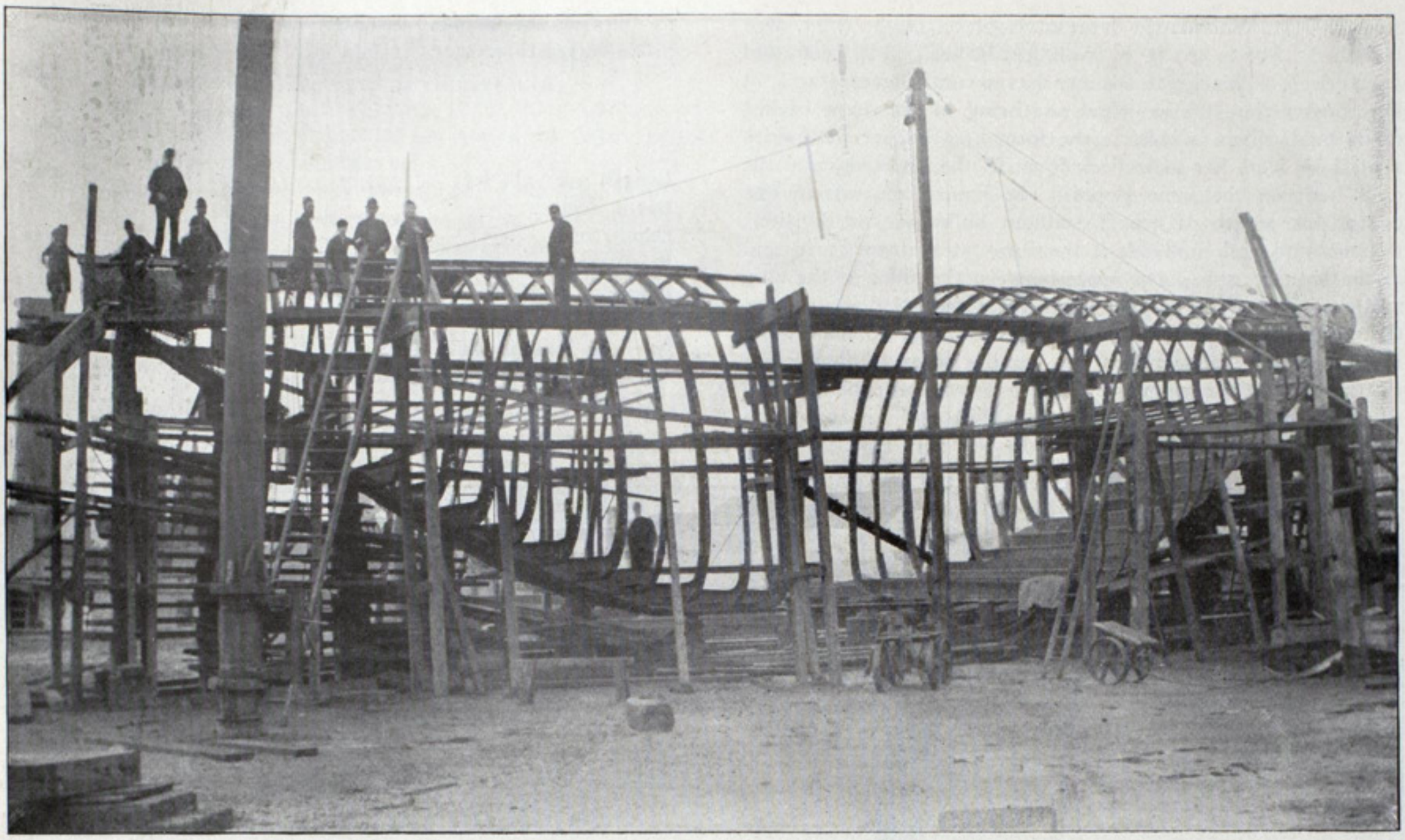


HOW IRON ORE WAS UNLOADED FROM A LAKE VESSEL IN THE 60'S.

was 187 ft. over all, 25 ft. beam molded, and 18 ft. deep. The photographs accompanying this article show the ends in frame and also plated up before dismantling for shipment. It was for a time thought that the whaleback would revolutionize the form of bulk cargo carrier on the lakes for within three years after 101 was launched thirty of them were built. However, experience proved that their advantages did not surmount their disadvantages and the new type was generally discarded. One by one they are disappearing.

In reviewing the history of ship construction on the great lakes it is quite surprising to note, now that great steamers are so common, that they are really the product of the past seven or eight years. The mean standard dimensions of steamers on the great lakes, even so late as 1894, were: Length, 295 ft.; beam, 40 ft.; depth 25 ft., and indeed for a long time ship builders hovered about these dimensions. During the past seven or eight years, however, progress has been rapid. Early in 1895 the first of the 400-footers, the Victory and the Zenith appeared, and in 1897 the Bessemer Steamship Co. placed contracts with F. W. Wheeler & Co., Bay City, Mich., for a steel steamer and two consorts, larger than anything previously built. The steamer was 475 ft. over all, 455 ft. keel, 50 ft. beam and 29 ft. deep. The barges were 450 ft. over all, 435 ft. between perpendiculars, 50 ft.

MARQUETTE IN 1860—THE ONLY ORE SHIPPING PORT ON THE GREAT LAKES AT THAT TIME—SHOWING TYPE OF ORE CARRIER THEN PREVAILING.

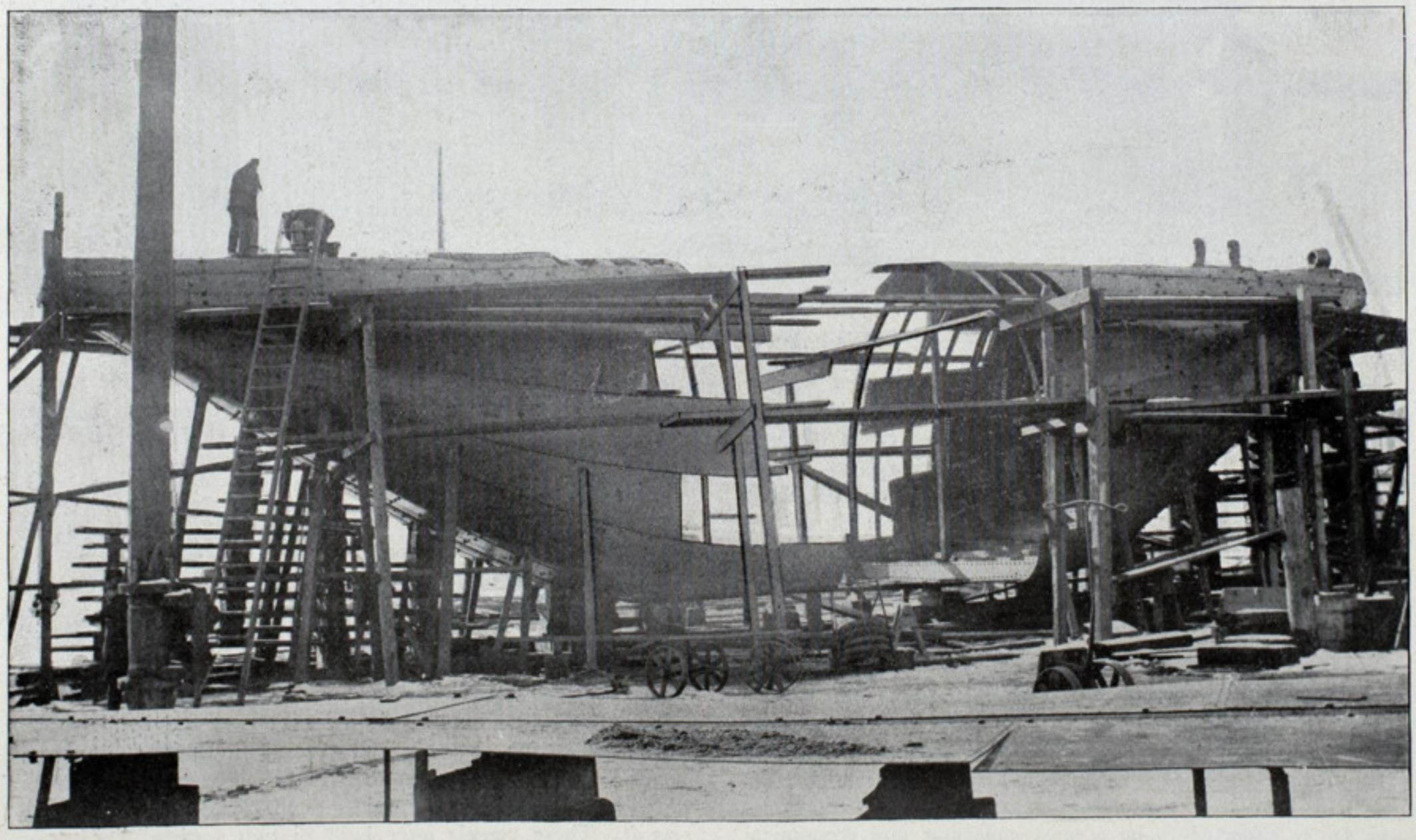


ENDS OF THE FIRST WHALEBACK, NO. 101, IN FRAME.

Built by The Pusey & Jones Co., Wilmington, Del.

beam and 28½ ft. deep. Mr. A. B. Wolvin, who from the start has been the leader in the construction of great steamships, placed

They are called 500-footers because they approach it so nearly, being less than 2 ft. short of 500 ft.



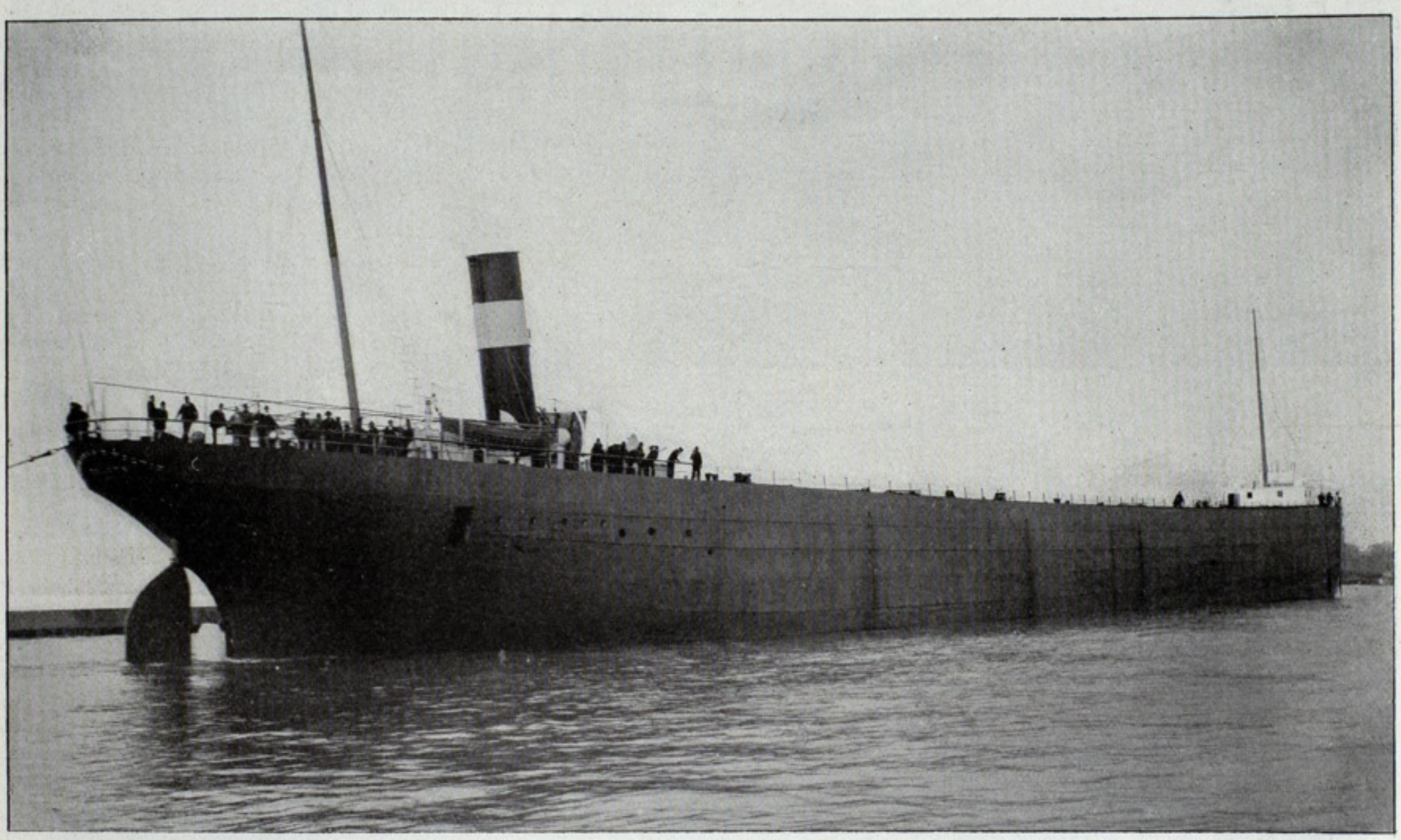
ENDS OF THE FIRST WHALEBACK, NO. 101, SHOWING PLATING.

Built by The Pusey & Jones Co., Wilmington, Del.

contracts for four 500-footers in 1900. These vessels are the John W. Gates, Wm. Edenborn, Isaac L. Ellwood and J. J. Hill.

The next great advance brings one up to practically the present month, as it was only a few weeks ago that the

Augustus B. Wolvin, the largest vessel on fresh water, was launched. She is 560 ft. over all, 540 ft. keel, 56 ft. beam and 32 ft. deep. This great steamer has several new features in her construction, the principal one being in the shape of her cargo hold. This is built in the form of a hopper with sides that slope from her main deck down to the tank top, and the ends built on the same slopes. The hopper extends in one continuous length of 409 ft. without bulkheads or divisions of any kind and in width it measures at the top 43 ft. and at the bottom 24 ft. The space between the sides of the ship and the sides of the hopper is used for water ballast, so that the water ballast, as well as being in the usual double bottom underneath the hopper, extends up the sides to the height of the main deck stringer. This construction was adopted to accommodate the use of automatic clam shells in unloading the cargo. Another novelty lies in the fact that the hold



THE AUGUSTUS B. WOLVIN IN THE RIVER AT LORAIN.

stanchions are dispensed with and in their place a system of girder arches is substituted, to support the upper as well as the sides of the ship. She has thirty-three cargo hatches, all spaced 12-ft. centers. The ordinary spacing is 24 ft. for hatches, but Mr. Wolvin in constructing the James H. Hoyt two years ago adopted the plan of allowing only 12 ft. between the centers of each hatch in order that the clam shells might unload the vessel entirely without any hand shoveling. This system is now being generally adopted in the later carriers.

Next to the Wolvin the Sahara, launched a couple of weeks ago for Mr. G. A. Tomlinson of Duluth, is the largest carrier on the lakes. She is 494 ft. over all, 474 ft. keel, 52 ft. beam and 29 ft. deep, with a 5-ft. water bottom, and follows the arch girder system of construction though she has not the hopper bottom. Her hatches, too, are spaced 12-ft. centers and she is expected to be a most capacious and economical carrier.

In 1890 the steamer Matoa, belonging to Pickands, Mather & Co.'s fleet, was the largest carrier on the great lakes and her average cargo was only 2,500 tons. The following table as showing the changed condition in a decade will, therefore, prove interesting.

LAKE FREIGHTERS OF A DECADE CONTRASTED.

	Steamer Matoa of 1890	Steamer John W. Gates of 1900
Length over all, feet	290	500
Beam, feet	40	52
Depth, feet	21	30
Registered tonnage, gross	2,311	5,085
Draught of water in channel, feet	15½	17¾
Average cargo, gross tons	2,500	7,000
Average loading time, hours	15	20
Average unloading time, hours	36	43

It is impossible to bring the comparison to the Wolvin at present because she is yet to carry her first cargo of ore but it is hoped to put 10,000 tons into her. As for the loading and unloading time it is being rapidly reduced by the new form of vessel construction. The James H. Hoyt has loaded 5,400 tons of ore in 30 minutes and unloaded it in 3 hours and 45 minutes.

That the lakes can well compete with the coast in the construction of cargo carriers is proved by the fact that the American Ship Building Co. three years ago built two salt-water craft, the Minnetonka and the Minnewaska. These ships were of the regular ocean type designed to have a dead-weight carrying capacity at 25 ft, 6 in. draught of 7,000 gross tons, and 700 tons of bunker fuel. Owing to the dimensions of the Canadian canal locks a limit of 44 ft. was placed on the beam of the vessel. Their general dimensions are: length over all, 443 ft. 6 in.; length between perpendiculars, 430 ft.; breadth molded, 43 ft. 7½ in.; depth molded to upper deck, 33 ft. These vessels were built in two sections each owing to the fact that they were longer than the locks. The sections were towed through the canals and joined together at Montreal. These two vessels were magnificently constructed throughout.

It might be added as an addenda on account of its historical importance that the first fore and aft compound engine on the lakes was placed by the Globe Iron Works of Cleveland in the propeller Egyptian, built at Black River, now Lorain, in 1873. The first steeple compound on the great lakes was placed on the steamer Susquehanna in 1867, under the Perry & Lay patent. This work was done by the King Iron Works at Buffalo. The first propeller on the great lakes was the Vandalia, a sloop-rigged craft built at Oswego, N. Y., in 1841. She was followed in 1842 by the Chicago and Oswego of 150 tons, both built at Oswego, N. Y.

SITUATION BETWEEN MASTERS AND OWNERS.

Another week has gone by and lake navigation in its real sense has not begun. A few vessels have been put into commission and others are prepared to start but there has been no general movement. However, the vessels that have gone out and are going out are to be regarded as the entering wedge into one of the tightest deadlocks that has marked the history of lake navigation. During the present week the executive committee of the Lake Carriers' association, represented by President Livingstone and Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., and the directors of the Masters & Pilots' association met with the Civic Federation and discussed the situation thoroughly. The meeting was a private one and both sides presented their cases. It is expected that the Civic Federation will make a report upon the controversy within a day or two. The owners represent that they have gone as far as dignity and honor can permit them to bring the present deadlock to an end. They offer to pay the same rate of wages which obtained in the Lake Carriers' association last year, even though the net earnings of the owners must of necessity be less this year than they were last. This offer, having been declined, the owners now maintain that they will not deal with the Masters & Pilots' association, but will insist upon making individual contracts. There are evidences of restlessness among the masters and it would not be surprising if a break should be made after the Civic Federation has had time to make its report. Several of the masters have especially criticized the order issued to them to return to their homes, because they feel as though that were an encroachment upon their personal liberty.

The Masters & Pilots' association has been pursuing the policy of expelling captains who have made individual agreements with the owners and taken out boats. In the case of Capt. D. P. Craine, who took out the Tomlinson steamer Saxona, he was fined $3,000 and then expelled. Craine is part-owner of the Saxona. A letter was published by the newspapers purporting to come from Capt. Craine, in which he greatly regretted his deflection from the ranks of the Masters & Pilots' association and wanted to know what he could do in order to be reinstated in good standing. The letter was very surprising in its character and its authenticity has been questioned. Capt. Craine is represented as telling Supt. Ripley of the Sault Ste. Marie canal that he had written no such letter. At any rate, up to the last reports he had not left the Saxona, which the letter represented he was about to do.

It is quite likely that a decided change will occur in the situation during the present week.

GRAIN CARRIER AND PACKAGE FREIGHTER.

For many years a question of great importance has been agitating the minds of Canadian owners of lake craft, especially those who carry grain. The Bertram Engine Works, Toronto, is doing its best to settle the question by producing the very best type of vessel built anywhere for the grain carrying and package freight business between Montreal, Quebec and the head of Lake Superior.

The company has on the stocks at present and will complete in about six weeks, a boat especially designed, after careful thought, for the cheapest and best method extant, for the carrying of grain from Port Arthur and Fort William to Montreal. Not only is she fitted up as a grain carrier, but is also fully equipped for the handling and carriage of package freight, having six 3-ton deck cranes for that purpose.

The intention is that this vessel, being able to run through the canals fully laden with a cargo of 70,000 bu. of wheat, should on her return trip take back a cargo of over 2,000 tons of package freight. Thus she would earn money on both trips, and as there is no doubt that she would be able to carry freight cheaper than the railways, there is no question of her ability to get freight. Indeed material coming from foreign countries might be billed to Montreal by ocean boat, and thence by this type of boat to Port Arthur and Fort William, or any of the United States lake ports.

Vessels of this character could be owned in the United States and operated as outlined. The vessel, being of Canadian register could trade between two Canadian ports, or between a Canadian and United States port, no matter who owned her; while a boat of United States register could not trade between two ports situate in Canada.

The dimensions of the steamer are as follows: 256 ft. over all, 42 ft. beam; 18 ft. deep. She will have one triple expansion engine 15, 25 and 42 in. cylinder diameters by stroke of 30 in., and two Scotch return tubular boilers each 10 ft. diameter by 11 ft. long for 180 lbs. pressure, and will run 12 miles an hour light and 10½ miles an hour loaded.

The Bertrams are not alone identified with the building of grain carriers but they also build passenger boats, ferries, tugs and yachts.

APPOINTMENTS OF MASTERS AND ENGINEERS

Northern Navigation Co., of Ontario, Ltd., Collingwood, Ont.: Steamers—Huronic, Capt. R. D. Foote, Engineer H. Brisbin; Monarch, Capt. E. Robertson, Engineer Thos, Crossley; United Empire, Capt. John McNabb, Engineer F. Clelland; Majestic, Capt. Andrew Campbell, Engineer Wm. Whipps; City of Collingwood, Capt. Geo. H. Playter, Engineer E. Robertson; City of Midlands, Capt. A. M. Wright, Engineer Saml. Burgess; Germanic, Capt. W. G. Cox, Engineer Jos. Asten; City of Toronto, Capt. W. B. Kitchen, Engineer Hugh Myler; Britannic not in commission.

Chicago & Muskegon Tran. Line, Muskegon, Mich.: Steamers—Charles H. Hackley, Capt. Wm. H. Evans, Engineer Wm. Baxter; Alice Stafford, Capt. Simon Lamereaux, Engineer John Golden.

Jerry McCarthy, Buffalo, N. Y.: Schooners—Grace Holland, Capt. M. Nagle; G. H. Warmington, Capt. Frank Desott.

H. I. Crandall & Sons Co., Boston, Mass., are making plans for a marine railway and dry dock 264 ft. on the keel blocks and 65 ft. wide, with a lifting capacity of 3,000 tons, for the Victoria Machinery Depot Co., Vancouver, B. C.

McCormick, Hauptman & Co., San Francisco, have given contract to the Bendixsen Ship Building Co., Eureka, Cal., for a lumber steamer of the following dimensions: Length, 165 ft.; beam, 36 ft.; depth of hold, 12 ft., 6 in.

The Cleveland & Buffalo line announce that the steamers City of Erie and City of Buffalo are now in daily commission. An illustrated booklet of the advantages of this route will be mailed to anyone on receipt of four cents in postage stamps.

Merchant Marine Commission.

The meetings of the Merchant Marine Commission in Philadelphia and Baltimore last week were attended by the prominent men of both cities. The Philadelphia meeting was held in the Board of Trade rooms in the Bourse, and the commission listened with great interest to men prominent in ship building and shipping. Among those who made statements before the commission were Mr. Charles H. Cramp, the veteran ship builder; Mr. De Coursey May, president of the New York Ship Building Co., Camden, N. J.; Mr. Alba B. Johnson of the Baldwin Locomotive Works; Mr. J. W. S. Holton, president of the Maritime Exchange; Mr. George E. Bartol, president of the Bourse; Mr. Joel Cook, president of the Board of Port Wardens; Mr. Edwin S. Cramp, Mr. Frank D. La Laane, Congressman Robert Adams, William R. Knight, federal shipping commissioner; James M. O'Brien, shipping agent; Alfred H. Love, president of the Universal Peace Union and many others. After the hearings the commission visited the Cramps ship yard and also that of the New York Ship Building Co. Both of these visits were of extreme interest to the members of the commission. The Philadelphia sessions were concluded with a dinner at the Union League.

Mr. Joel Cook was the first speaker at the Philadelphia meeting. His remarks were chiefly introductory and he outlined his views in a few sentences. He was against free ships and was in favor of extending the American principal of protection to American shipping, but had no specific suggestions to make as to how it should be done.

MR. ALBA B. JOHNSON'S SPEECH.

Mr. Alba B. Johnson made a very powerful speech from the standpoint of the exporter. He judged the situation wholly from that of the shipper and said:

"I come before you, not as a builder of ships personally interested in building up a great industry of vital importance to the national welfare, which through unfavorable national policy, has been allowed to languish; nor do I come as an owner of ships, depending for a livelihood upon the earnings to be derived from their profitable operation. I represent the manufacturers of our country, whose business has been originated and built up through the wise application of protective principles, and who are engaged in extending American commerce to every country of the world. Were we to regard alone our immediate interests, we might say that it makes no direct difference to us, whether our products are shipped in American or foreign vessels, provided the rates are as low as those enjoyed by our competitors. This would, however, be too narrow a view of the matter. The extension of American commerce in American ships, means a multiplication of American houses in foreign ports interested in promoting American trade. It means an increasing respect for American prestige where our flag has hitherto been unknown, and it also means the extension of American banking and finance in countries not controlled exclusively by foreign capital. Last, and not less important than the foregoing, it means that our government shall have in time of war an ample supply of American vessels available as transports.

"Our great industries have been built up by a protective tariff, and have now become so strong that in many fields we are able to find an entrance to foreign markets. In denying the right of United States registry to foreign-built ships, we have extended the protection of our laws to our ship builders. The operation of these laws affords not merely protection, but absolute prohibition of any foreign competition. By our navigation laws we have given to American sailors, protection greater than any enjoyed by his fellow-workmen on shore. The American ship owner engaged in foreign commerce has, however, received no protection, but has been left exposed to an unlimited destructive competition. His only refuge from bankruptcy has been to confine his ships to coastwise commerce of the United States, and to build no more than can find profitable employment in that limited field.

"The ship builder naturally desires to maintain the protection of the present laws, because they afford the maximum protection possible. The ship owner may desire free ships so that he can buy ships in the cheapest market. He may also desire the relaxation of our navigation laws, to enable him to operate them upon as favorable a basis as the ships of competitive nations. We want our ship builders to have a monopoly of building our new merchant marine. We want our sailors to be the best paid, as the best treated of any in the world. We are not prepared to deprive any industry of the protection necessary for its existence, and the problem which we are called upon to solve, is how to provide the protection essential to the prosperity of all three classes. The additional cost of building ships in American ship yards, and operating them under American navigation laws, are real obstacles to the revival of American commerce which must be removed before our flag ceases to be a curiosity in the ports of the world.

"We need most of all a fleet of tramp steamers, such as are built in England on £1 shares, and are chartered to carry freights to every port in the world. If our cargoes are carried in American bottoms, our mails will not long be carried under foreign flags.

"I believe that our people as a nation, are sincerely desirous of removing the obstacles to the revival of our shipping, if they can be satisfied as to what is the proper method of arriving at this result. The most direct method is by subsidy. Our people are, however, reluctant to approve of subsidy legislation, fearing that it will be abused for the undue advantage of particular interests. They are also uncertain as to the amount of subsidy necessary to equalize the difference of conditions, without pauperizing the interests affected. For these reasons, every subsidy measure introduced into congress has been bitterly contested, and its defeat or postponement has been accepted with more or less approval by the country at large. Whilst it is necessary for us to offer subsidies for a limited number of years for the purpose of stimulating the construction of American ships, I believe that they should be adopted in moderation, and I am also of the opinion that the subsidy principle should not be adopted as the sole method of encouraging the revival of our shipping. I would advocate, first, ample compensation for carrying the mails to foreign countries in ships bearing the United States flag, the rates being graded according to the speed; second, a moderate tonnage, bounty, or subsidy, payable only upon the outward voyage, but sufficient to make profitable the carrying of cargoes of all classes in line and tramp steamers of American register; third, I would promote importations in American ships by enacting a general law allowing a sufficient reduction of duties to create a preference for shipments of homeward-bound goods in American vessels. For instance, a reduction of 10 per cent of duties might be established for imports in American sailing ships, and a reduction of 15 per cent if in American steamers. I believe that this would be sufficient to cause American importers to insist upon a preference being given to American ships by foreign shippers, and create a demand for American charters, both outbound and inbound, which does not now exist.

"We have come to a point in our industrial development, where the belief is widespread that certain industries receive greater protection than is necessary to equalize the difference of industrial conditions at home and abroad. That this belief is justified, is evidenced by the willingness of some manufac-

turers to quote lower prices for export than for domestic sales. The time has come when some reduction of our tariff restrictions may be made for the purpose of promoting our reciprocal exchange of goods with foreign nations, and in ensuring that a fair part of this exchange shall be made in American ships. During the past forty years we have built up and maintained a tariff wall for the protection of our industries, and they have grown strong and prosperous, until many are equal to competition with any in the world in their particular lines.

President McKinley's last speech at Buffalo, in favor of reciprocity treaties struck the key note of this belief, and I believe that were this great apostle of protection still amongst us, he would advocate this use of our existing but unnecessarily protective tariff, for the purpose of accomplishing the revival of American shipping, which is desired by the whole nation, and the extension of the protective principle to the American ship owner who hitherto has alone stood unprotected."

MR. GEORGE E. BARTOL'S SPEECH.

Mr. George E. Bartol, president of the Bourse, read with dignity and a great deal of emphasis an elaborate and thoughtful paper, in which he pointed out the cause of the decline in American shipping and the remedy therefor. He said:

"It is with a feeling of timidity that I venture to address you as to the remedies necessary for the revival of the American ship-owning interest. The subject is so great a one and my opportunities for studying it have been so limited that I feel that any suggestions I may make will be of little value. Yet if I correctly understand the purpose of the appointment of this commission and the purpose of these meetings in various cities in different parts of the country, it is that opportunity may be afforded to 'many men of different kinds and many men of many minds' to express to your honorable body, their individual views as to the remedy or remedies needed, so that you, after hearing all of these diverse views, may cull the wheat from the chaff, and submit to the congress of the United States recommendations as to what remedies in your judgment are requisite to be applied to cure what all admit to be a deplorable condition, viz., the dependence of this great country upon foreign nations for the carriage of its vast export and import commerce, or, expressed in another form, the restoration of the American shipping interest, so that American trade may cross the seas in American ships and protected by the American flag.

"My first experience with the American ship commenced at an early age, my tastes leading me to read the stories relating to the exploits of our ships in the wars of 1776 and 1812; also, the many fascinating tales published for boys concerning whaling and other hazardous ventures upon the seas. Such early reading naturally culminated in a sea voyage, and at sixteen years of age I shipped as 'boy' on an American barkentine of 325 tons burden, hailing from Bath, Me., and bound on a voyage to a port on the Black sea, Southern Russia, with a cargo of Baldwin locomotives, returning at the end of nine months to Philadelphia, after touching at several ports in the Mediterranean. That was in 1874 and I have been more or less intimately connected with the shipping trade ever since.

"First. In the sugar business, employing a number of American vessels every year in the trade between ports in the West Indies and this city.

"Second. In the general importing and exporting business with Europe and the United Kingdom, employing for general business the various lines of foreign owned ships plying on the North Atlantic, and for the grain trade English tramp steamships.

"Third. The West India fruit trade, in which I am at present actively engaged and employing four foreign ships under time charter—three of them being Norwegian vessels and one English.

"I have never been a ship owner and cannot, therefore, speak with any knowledge of the difficulties experienced by them in competing with foreign owned ships, but my natural tastes and affiliations have been such that by a process of what may be termed mental absorption and sympathy I have formed certain ideas on the subject under consideration, which I shall now endeavor to present to you in a condensed form:

THE DISEASE, ITS CAUSE AND REMEDY.

"First. The disease: The practical disappearance of the American flag and the American owned ship from the foreign trade. This, of course, applies especially to the steamship, which, as a matter of fact, never really existed in the past at all under the American flag, the decadence of the shipping interests dating from about the period when the ocean steamship commenced to be a factor in the trade, but the remedy must deal with methods of encouraging the growth of the steamship interests for general commerce.

"Second. The causes of the disease: These are numerous and complicated, but as I see them, they rank as follows, the most important first:

a. American capital has not, until very recently, been sufficiently abundant to make it necessary for its owners to take low rates of return for its use. The capital requirements of our country for its own internal development have been very large, and such use of capital for internal development has brought to its owners vastly larger returns than were to be found in the ocean carrying trade, where the competition was keen and the average rate of return on capital invested was low when the risks were considered. This cause of the disease, I believe, is entitled to first place in considering the subject, but it is a cause which is remedying itself. Capital here is becoming daily more abundant, the average rate of return for its use is falling, and Americans are showing a willingness to invest money abroad, which a few years ago they did not exhibit.

b. The greater cost of operating American ships, which is admitted from 50 to 100 per cent above the cost of operating foreign ships. This cause can only be remedied by legislation which will afford complete relief from the burden.

c. The greater cost of constructing ships in American yards, owing to the higher wages of American mechanics. This is a variable quantity, differing in different years, and also with the class of ship, but may, I think, be safely averaged at from 25 per cent to 50 per cent. Probably for the ordinary cheap cargo boat the difference would average nearly 40 per cent to 50 per cent. Some figures recently obtained on the subject indicated that a small steamship, which would cost about $80,000 to build abroad, would cost on this side about $110,000 to $120,000.

"The three causes above named cover in my opinion the main causes of the disease and brings me to the remedies, and I have no doubt your honorable body will be so overwhelmed with the number and variety of remedies which will be suggested to you in the course of your investigations, that you will be embarrassed with riches.

"The cause to which I have assigned first place, viz., the disinclination of American capital to invest in ships because of the higher rates of return to be secured from investments on the land, is, I believe, rapidly being cured by natural causes, and will entirely disappear if the American ship can be operated as cheaply and cost the owner no more than the ships he is competing with. Whatever cures the next two causes of trouble will immediately cure the first also.

"The second cause, viz., the greater cost of operating the American ship under the conditions and laws existing today. I believe the only remedy is to permit the American ship to secure her crew when, where and on such terms as she pleases without restriction. I am not considering at all any question of creating a body of American seamen to fill the ranks of our

navy, but simply the question of a fleet of American owned trading ships to compete in the ports of the world for the carrying business of the nations. These cargo vessels will get no favors in the matter of freight rates or port charges. They must compete with the ships of the world, and to do so, must be able to operate as cheaply. The fleet cannot be created, capital will not invest, unless on at least an equal footing with competitors. This proposes no hardship to the American sailor in this trade, as he does not exist· the fleet does not exist, it is to be created· it is a new industry and it can not well be protected. When the ship passes into blue water, she must meet all the world on equal terms.

"The question of a body of American sailors as a reserve for our navy is a question foreign to the subject under consideration, but if necessary to be considered let them be drawn from our coasting vessels or lake carriers, which can be and are protected, and might be compelled to carry American crews. Patriotism is not confined to sailors, and landsmen from our interior districts make good naval seamen with a very few months of training on a cruising training ship. The old time able bodied seaman, who could hand, reef and steer, finds little room for his knowledge on a modern man of war without a rope, spar or sail on board. A good blacksmith who did not get seasick would be quite as patriotic and more useful in a few weeks.

"The report of the commissioner of navigation shows pretty plainly that the only effect of our restrictive laws relative to the engagement of crews is to raise the rates of pay on American ships, without giving them American crews. The percentage of foreigners on American ships has ranged, during the years from 1903 back to 1894, from 51 per cent to 71 per cent. The principal effect of the higher pay on American ships is to make the operating of the ships unprofitable and to encourage desertions from foreign ships when in American ports.

"The superiority of the American crews as at present constituted, which would be the only warrant for the higher pay they receive, is not proven by the tables given in the report of the commissioner of navigation, which set forth the number and causes of casualties to American ships and foreign ships.

A SERIOUS BUT REMEDIABLE DIFFICULTY.

"The third cause I have named, viz., the greater cost of constructing ships in American ship yards is a serious but remediable difficulty. Some sort of refund must be made to the ship owner as an equalization charge to offset the higher first cost. With this fairly adjusted, and to adjust it fairly is a matter of mathematics, the ship owner will be content to pay the higher first cost, and the ship builder and his employes will disappear from the consideration of the question, as they will be satisfied and will get the business.

"In considering the matter of such an equalization charge, as will reimburse for this original higher cost, it must be borne in mind—

"a. That the capital sum representing the higher cost must be first paid out, and that the interest on the said sum will go on nights, days and Sundays; also, that a ship must be insured, this extra cost must be insured and that extra insurance cost goes on all the time. Further, a ship wears out and a proportion of the extra cost must be charged off annually. All of the above charges go on whether the ship be busy or idle, carrying cargo or sailing in ballast, and no tonnage payment based on tons or freight carried will fully meet the requirements. It will be too much under some conditions and totally inadequate in other cases. The more cargo a ship has on board, the less she needs governmental help; inversely, the less cargo, the more help is needed, as the owners are not receiving so much freight money. She should be helped to go from port to port in ballast, as unless she can do this on equal terms with competitors, she is handicapped in competing for business. The expenses I have named go on all the time and must be offset all the time. To pay a refund based on the tons of freight actually carried will miss the mark and simply cause the ship owner to become a rate cutter. It will be a case of any rate of freight to get the tonnage. The ship must not be treated as a pauper, it is not a case of charity, it is simply a case of refunding in a legitimate, dignified way the extra cost due to our American system and higher wages.

"b. If the laws should not be so changed as to permit of the crews of such ships being employed on a competitive basis, then, of course, it will also be necessary to compensate for the extra cost of operating involved in running ships under the existing laws, and such compensation should and must cover the operation of the ship under all circumstances when these extra expenses are running, ship sailing full loaded, light or in ballast, for the extra expenses of the crew are just the same under all of the above named conditions. For this class of compensation all time spent in port above a proper number of days could be deducted, so as to encourage ships to be at sea and not idling in port.

"I have endeavored to set forth the causes and remedies as they appear to me and trust that they may prove worthy of your consideration.

"I have not gone into any statistics to prove the case, or suggested any details as to the remedy. The statistics I know are at your service in any volume you may desire, and the details of the remedies suggested will involve a vast amount of labor, but if I understand the matter, the trouble is admitted, and the prime causes of the trouble are known and admitted, then if remedies along the lines I have advocated are accepted as a principle, there are no real difficulties in the way of their proper application., and the question resolves itself into a matter of figures.

"The American citizen can and must be made to understand that the American tariff, which protects American labor and American products within the boundaries of American territory, cannot protect the American-built ship when she passes out onto the blue water beyond the confines of the tariff barriers."

MR. FRANK J. FIRTH'S REMARKS.

Mr. Frank J. Firth, president of the Erie & Western Transportation Co., who has had a very thorough-going experience on the great lakes devoted his attention to the discussion of the subject from that view point. His address was full of facts and will be published in the next issue of the Review.

Capt. W. Randle, superintendent of the New York Ship Building Co., discussed the situation briefly. He thought the best remedy would be the granting of a bounty on the net register tonnage of each American ship in the foreign trade, saying: "A 5,000-ton steamship running to Brazil with a bounty of five cents a ton would receive on each voyage $1,500 and a 8,750-ton steamship, like the Manchuria, building at our yard, running to China and Japan, would receive $6,725. I consider that the fairest measure that could be adopted for the reason that the smaller and slower ship would receive aid in due proportion to that received by the larger and faster one."

E. R. Wood, representing the National Board of Trade, said that in order for the American marine to flourish it must have a cheap initial cargo. With England today the initial cargo was coal, which was carried at $1 a ton, while American ships could not afford to carry it for less than $3 a ton. American coal ought to supply the initial cheap cargo. He proposed a bounty on the export of coal which would equalize the condition as regards American and English ships. To appease the American purchaser of coal, he said, a bounty might also be placed upon cereals which were exported.

Frederick W. Taylor, who charters many foreign steamships running between Philadelphia and London, said that he did not see any way of getting at a solution of the pending

question except by allowing shipping men to buy their ships in the cheapest market and run them under the American flag. I know we would be running up against a sentiment; but we have to operate a business and on business principles. High-grade ships can be bought today at very much less than it costs to build them. Without free ships I do not see how you can help the shipping interests unless you establish a subsidy. But that would result in an over supply of tonnage. There is too much in the world now.

"The tariff has been a very great advantage to this country, but the question is whether we have not arrived at the time when reductions should be made in it along general lines. The general demand of the country is for a reduction. This would mean the bringing of larger return cargoes to this country."

Senator Gallinger—"Then, what becomes of our own manufacturers?"

Mr. Taylor—"They will live like the others. Our iron masters do not fear the position which you gentlemen take when you favor the erecting of competing armor-plate plants.

"I would allow American ship owners to get their officers anywhere. If there were no law restricting the shipping of sailors, we could get them at the same price that foreign ship owners do."

Henry R. Edmunds, lawyer and vessel owner for the last forty years, said that the proposed subsidy or bounty, it seemed to him, would be very much in the nature of a tariff law. "You do protect manufacturers," he said; "you do not protect the man who has arid land in the West that needs irrigation."

Senators Gallinger and Lodge together: "That's just what the government did in the last congress."

Mr. Edmunds: "Well, if the government did that, then it's time that you came and helped us. Probably those people had the same right to that that our shipping has to a subsidy. It seems to me that a subsidy is the least objectionable of any method of help. Yet I don't see how a subsidy would reach the question of wages. The difficulty in the United States is that we haven't the sailors. More schoolships, more intelligent sailors are needed."

Mr. Charles H. Cramp made a most important address reviewing the promises of subsidy legislation that have been repeatedly made and as repeatedly forgotten. This address will be exhaustively treated in a later issue in the Review.

A statement from Lewis M. Haupt, the engineer, was read, in which he said:

"Our navigation laws, judging from their effects, would seem to have been framed to prevent Americans from competing with the ocean carriers of foreign nations, since they prohibit us from taking advantage of the cheapest markets for ships and the economies necessary to their successful operation. It is purely a business question, and while the fiction of protection to the American ship builder remains there seems to be no relief save the granting of such bounties or subsidies as will more than offset those which are granted by the free-ship countries.

"The remedy seems plain. We can undoubtedly build as cheaply as any country if the restrictions be removed. We should, however, be permitted to buy our ocean carriers in any market, equip them from any country and enter them under American registry, with such premiums, subsidies or bounties as would maintain them until the trade is recovered, just as we encourage our inventions by letters patent, or subsidize our railroads, waterways or all other works looking to the public weal. This done, our merchant marine will be restored in a short time."

E. K. Stevenson advocated the payment of a tonnage bounty to American ships above a certain capacity. Samuel B. Macdonnell attacked the statistics of the bureau of navigation at Washington. The figures representing American ocean-going ships, he said, were padded by including catboats, small sloops and ferryboats.

A statement from David C. Reid, of Harlan & Hollingsworth of Wilmington, Del., was read. He said:

"To my mind, the revival of American shipping can be accomplished easily by allowing the builder to overcome the difference in the cost of building by a tonnage bonus equivalent to the difference in the cost between himself and his European competitors and mileage allowance sufficient to overcome the difference in wages and expenses paid in American ships used in the foreign trade."

MR. E. S. CRAMP ADVOCATES DISCRIMINATING DUTIES.

Mr. Edwin S. Cramp, vice president of Cramps, reviewed the difficulties of ship building in this country and, in advocacy of discriminating duties as an aid to the rehabilitation of the American marine, said that if governmental aid were given capital would invest in ships as it does in street railways and other securities. While Mr. Cramp was discussing the high price of steel, Senator Mallory asked him which he considered the best quality, that produced in America or in England.

"I would rather not answer," replied Mr. Cramp.

When pressed by Senator Gallinger to give the commission the benefit of his knowledge he declared that the English steel was the best. Mr. Cramp in his address said:

"Preceding the Spanish-American war, prices of materials entering into ship construction were at the lowest point ever known and lower in this country than in Europe—so much so that the price ruling then was one cent a pound for all plates and shapes at Pittsburg. At the same time the prices ruling in England were from $25 to $27 a ton. The difference between the price at Pittsburg and the price charged by the English mills afforded a ready market for the surplus of this country, so that many hundred thousands of tons of materials were delivered at Glasgow and other ship building points in Great Britain in competition with the prices ruling there. Subsequently the Spanish war and the great prosperity following the first year of McKinley's administration caused prices to become so high in this country that in the course of the next two years the exportation of such materials ceased altogether.

"The extreme range of prices within four years varied in England from $27 to $37 a ton, whereas, in America, materials under the same tests of Lloyd's and other classification societies have varied in price from $20 upward to $60 a ton. Today the prices which have been maintained by the manufacturers are as follows: Steel plates, 1.75 cents; shapes, angles and channels, 1.75 cents, and bulb angles, 1.75 cents a pound. On the other hand, the price ruling in England for steel plates and shapes delivered clear of insurance and freight at Philadelphia, but not duty paid, is 1.40 cents a pound. The ability to consume steel in this country increased beyond the most sanguine expectations, so that in six or seven years we more than doubled the product of our pig iron. Yet the delivery of these materials was so slow and uncertain that frequently we were compelled to wait a year before our orders were finally completed. This, as you may see, interfered with output, and necessarily increased the cost of production, where, as in England, an order for all the material entering into the construction of a vessel could be delivered inside of two months.

"For nearly six years freights have been as low if not lower than at any time in the history of ship building. Wages have been cut from 5 to 10 per cent in ship building in the northeast. These factors, together with the fact that prices for material for ship building have receded until they now average about $25 a ton, have had the effect of inducing ship builders in England to offer to construct ships at abnormally low figures.

With $40 a ton as the basic price you will see that the builder in this country starts off with a handicap against him of $15 a ton.

ENGLAND USING LABOR-SAVING DEVICES.

"Not only do we suffer under these disadvantages, but, commencing with the McKinley administration, labor has risen in this country by reason of the great prosperity from 30 to 40 per cent so that the argument which you have heard urged so often that the American mechanic can do more than the English mechanic and that the introduction and application of labor-saving devices enables the American to increase his output very largely over that of England, does not hold good. The same labor-saving devices that we have introduced and applied in America are being introduced and applied in every ship yard in Great Britain, so that the amount of work a man can do there is increasing and will continue to increase. At the same time we are paying double the wages—from 50 to 100 per cent more—than is being paid in England for the same labor. If we apply the figures as to the cost of materials in the construction of a 1,200-ton ship, intended for crossing the Atlantic ocean the steel and iron which enter into both hull and outfits and engines and boilers—that material alone being 60 per cent higher here—will amount to a handicap against the American builder on one single ship of $150,000. Then if you add to that the difference in the price of labor you will see at once the great difficulty which the ship builder here is laboring under if he wishes to put his ship on a line to foreign ports in competition with a vessel built at a foreign port.

"There is another argument which I do not think has been brought out enough in discussing this question as to the cost of ships here as compared with England—which, of course, the steamship company, must stand—and that is the fact that in England ship building and ship owning is the great industry, as railroading is in this country. The volume of ship construction there is so great that ship builders have been enabled to devote their attention to specialties. For example: Some yards build only large cargo boats, others, high speed steamships, others naval vessels, others torpedo boats and destroyers, others smaller craft of from 5,000 tons and less, whereas in America, owing to the want of a large market, the builder who may have from five to six ships will frequently have under construction the same number of ships, every one of which is of a different type. You can see a large tug boat on one slip, a river steamer on the next, a cargo boat on the next, a cruiser on another, and a battleship or a passenger ship on the next slip.

"Now, while this diversity of product may result in a better all-around knowledge of his trade on the part of the individual ship builder, yet you can see that it certainly interferes very seriously with his cheapening the production. If the American ship builder, as has been the case on the great lakes, had the opportunity of selecting his type of ships and could have his five or six vessels all of the cargo type under construction at one time, it would enable him to introduce methods of piece work, of standardizing, of details, etc., which would enormously decrease the cost of construction. This, of course, has been the reason why in iron and steel, and industries of a kindred nature generally in America, the individual manufacturer has been enabled to pay higher wages and by reason of his enormous output so to cheapen the production that he can undersell the manufacturer of similar articles abroad who would pay lower wages. Nothing led to the achievement of this result so much as the aid given by our government in land grants for twenty years which led to the building of a great number of transcontinental and Pacific railroads, and the building up of rail mills, locomotive works and other allied industries.

FIRST COST AND COST OF OPERATION.

"Now all this, of course, refers to the first cost of the ship building being higher in this country than in England and has nothing whatever to do with the operating expenses of the vessels after construction. The matter has been taken up very exhaustively by Mr Chamberlain in his report of 1902. For the reasons enumerated above the cost of ships in America which at the time of the beginning of the McKinley administration had approximated the cost of the ships of a similar type by first class builders in England within 10 or 15 per cent today cannot be produced within 40 per cent.

"It will be well in speaking of this to bring out very clearly the fact that the bare statement as to cost by free ship men is misleading, for the reason that with the people who made a speciality of building cargo boats on the east coast of England the cost by them is frequently from 10 to 20 per cent higher than the cost of building the same type of ship by the people of Glasgow and Belfast, and any comparisons made should have this fact clearly in view.

"Also the percentages of difference of the cost as a basis of comparison varies with the class of the vessel. With the low-priced cargo boat and tramp the percentage is larger than with the high speed, high-class passenger ship, which latter more nearly approximates in price the American built vessel of similar requirements.

"These causes have in part brought about the present condition of affairs. The responsibility for the other part rests with the congress of the United States, which has deliberated for over fifty years and accomplished little in the way of effective results in this direction. To compensate for the omissions of the past I would suggest:

"First, that congress should pass an act similar to the one introduced by Senator Lodge in December, 1903. The increase in ship building and ship owning that would follow the enactment of such a law would be so great that it would test the full capacities of the constructive establishments, as well as the efficiency and capability of the personnel in the ship owning line.

"Second, an increase in the postal compensation of at least 50 per cent, bringing the total up to the amount incorporated in the original bill of 1891. The statement was made at the time of the passage of the act that the amounts as amended would not be sufficient to accomplish any great results, which certainly has been the case.

"Third, inasmuch as the huge 20,000-ton ship was not thought of in 1891, there should be another rate established for vessels of not less than 15,000 tons, having a speed of not less than twenty-two knots. As Senator Penrose expresses it, mail compensation routes should be established by law for strategic effect, and this would provide all of the high-class auxiliary cruisers that the government might require.

"Among the great advantages of such indirect discrimination duties would be that the profits would not be excessive, thereby not tempting the promoter to establish lines for flotation purposes only, destroying the business of the regular companies, nor would it stimulate the organization of mushroom ship building companies with their subsequent receivership troubles.

"Time is an element in any solid growth and in no case is this more true than in the commercial world, but the government must give the inspiration for the first step.

"The policy of free ships will not rehabilitate the merchant marine any more than free trade in materials. For the past ten years we would have availed ourselves of the use of foreign materials for American vessels in the foreign trade, but when business was at its height the price of materials was lower here than abroad. Now while the prices are lower abroad than here no one wants to build any kind of vessel.

PRESENT CONGRESS HAS ACCOMPLISHED SOMETHING.

"The present congress, in passing three wise measures for the rebuilding of the American merchant marine has done

more than any previous congress, and should that same body pass such measure as the ones above suggested it can be truthfully said that it will have accomplished more and better results than all previous congresses.

"In closing I would like to say something of the necessity of this commission committing itself in favor of a few 'pot boilers.' I speak for the coast trade. The conquests of the United States' arms in the last seven years in the acquisition of Porto Rico, Hawaii and the Philippine islands have added imperial possibilities for the development of the coastwise business. For years past the attention of all commercial classes has been turned to the profitable pursuit of getting ahead of the government by the enrollment of whitewashed tramps and floating coffins. In the last twenty years more than 350 of this class of vessels have been granted American registry. Of this number there are still afloat about sixty-three steamers and of the latter forty-eight are in the coastwise trade.

"This commercial crime has been encouraged by builders who repaired, by companies who bought the wrecks, and by congress which enrolled them. The result has been nothing but bad. A free ship enrollment of the same number of foreign vessels of modern type and construction would have been of some value. But the class and number of ships that have been thus registered have contributed largely to the destruction of the building industry and also to the lowering of the quality of the floating equipment of the nation. The most celebrated, the "Merrimac," saved her reputation by being sunk at Santiago.

"Such a policy as has been pursued is manifestly destructive to the builder and to the mechanics; it harms the ship owner who has built the high-priced American ship and it robs the nation in times of emergency, when it must depend on such vessels for transport and collateral services. Properly fostered the American coast trade can be built to the proportions of the mercantile marines of any of the nations of the world saving only the four largest.

"Another 'pot boiler' for the American marine would be to require the materials entering into the construction of the Panama canal to be carried in American bottoms.

"I have spoken in favor of indirect discrimination and of an increase in the postal compensation because they carry little or no grant of money from the public treasury. There seems to be a public sentiment prevalent which refuses to endorse any such measures as the best exemplified in the encouragement given the Cunard Line by the British government. It is the most prominent example of special legislation and treasury gambling that the world has ever seen and yet no man of the commission has heard or read of its condemnation by any American reformer or purist.

"To do more than I have intimated, in my judgment, would harm the business, and to do nothing will result in its total annihilation.

"Crystallize into laws these suggestions and the volume of trade for American bottoms will give the engineer and the contractor the number of vessels necessary so that they can specialize and standardize with ever-cheapening effect, and the cargo will be carried on the American ship as cheaply, comparatively, as the freight is carried on the American railways; but it will not come before. The wise statesmen of congress legislated for the building of the railways of the West, and why not at this time and in the same way legislate for the steamship routes of the ocean?"

THE COMMISSION IN BALTIMORE.

At the Baltimore hearing of the commission Mr. Bernard N. Baker was the first speaker. He gave an exhaustive account of his own experience in the shipping business as the organizer of the Atlantic Transport Co. He advocated the paying of a ship subsidy as the only means whereby our merchant marine can be restored to its former greatness.

"When the subsidy bill was introduced in congress," he said, "our company at once contracted for six large steamships to be built in the United States under the assurance that the bill would be passed. You all know its failure. Two of these steamships were disposed of to a trade limited entirely to American built steamers (the Pacific mail), where they will, fortunately, remain under the American flag. The other four ships, being of the class of freighters, have been laid up, I believe, for a greater portion of the time since their delivery and cannot be profitably employed under our flag. The first question to consider is: Do the people of the United States want a mercantile marine? The second is, Do we need it? The absolute necessity for a mercantile marine was demonstrated at the beginning of the Spanish-American war. Without going into detail, I found that it was impossible for the ships then under the American flag to carry all our troops to Cuba and the Philippines. The result of this was the transfer to our government of seven large steamships then under the English flag. I think this demonstrates the absolute necessity for the United States to have under their own flag a sufficient amount of mercantile ocean tonnage to meet any emergency that might arise.

"When we come to the more important question of the so-called 'commerce destroyers,' or fast transports, I believe that today France, Germany and England, in the event of difficulties with us, could destroy every vestige of American ocean commerce within sixty days after hostilities had been declared, and that our navy would be powerless to capture the 22 to 25-knot ships owned by these countries. Again, were it necessary to transfer any large number of troops to a foreign soil, there is not one first-class power that could not deliver them to such foreign soil in a fraction of the time required by the United States with our merchant marine in its present condition.

"As a remedy for this condition I suggest that congress should make an appropriation of an amount each year for so many years for the building of American shipping. This should be made subject to a contract being entered into by public proposals, so that no one citizen or corporation of the United States would have undue advantage; that the government superintend the making of these contracts, and that under no circumstances would the transfer of these ships to any foreign power be allowed for twenty years, which is the average life of a good ship.

"Suppose the government were to use for this purpose $15,000,000 per year for ten years as a subsidy. At the end of that time we would have a merchant marine and fast mail service second to that of no country in the world. In that time I believe that not less than 2,500,000 of American steamship tonnage could be added to our merchant marine. Besides this it would give employment and profitable work to hundreds of thousands of our people who are now suffering, and are leaving us to return to foreign ship building yards on account of the fact that they cannot obtain work in this country."

Mr. Baker's remarks were listened to with great interest by the commission, and at the conclusion of his address he was asked many questions regarding his suggestions.

MR. F. W. WOOD SAYS GOVERNMENT SHOULD AID.

Mr. F. W. Wood, president of the Maryland Steel Co., told the commission that the proper way to rehabilitate the merchant marine is to pass such legislation as will make ship building profitable so as to enable our shipping interests to compete with that of other countries. He said, in part:

"We come here fully recognizing the fact that the American merchant marine is fast dwindling down to almost an insignificant factor in the world's commerce. If the American people want the conditions changed they must have legislation to protect the American shipping interests. We don't hesitate to use legislation as a means to accomplish any other public good,

and why should we hesitate at passing a law which will be of inestimable value to the great commercial interests of the country? What kind of legislation is necessary and how far it should go is a matter on which divers opinions have been expressed. In my mind, if we legislate to make ship building profitable, ships will be built in this country and it will not be long before the American merchant marine will once more be in the ascendency on the high seas. There are several reasons why the American merchant marine has dwindled down, and among these are the increased cost in construction in the country and the increased cost in operating ships flying the American flag. Under present conditions the cost of constructing vessels in this country is from 30 to 50 per cent greater than in Europe. This is due to the increased cost in material here and the higher rate of wages paid the workmen in American ship yards.

"If we hope to accomplish anything we must legislate by cutting down the cost to American ship owners. The difference in the cost of American-built vessels and the foreign-built vessels should be paid by the government in the shape of subsidies. To continue that indefinitely would, of course, be impracticable and would not be necessary, for I believe that the changed conditions would soon bring work enough to our yards to enable the American ship builder to bring the cost of construction down to the basis which now exists elsewhere. How long it would be before such condition would be brought about is hard to say, but I think that in ten years such results could be accomplished."

Mr. Wood cited several instances where his company had bid in competition with English ship building companies for the construction of vessels, and he stated that the English bids were much lower than those of his company. In response to questions put by members of the commission Mr. Wood stated that the subsidy on a vessel as large as the steamship Maine, built for the Atlantic Transport Co. by the Maryland Steel Co. would amount to about $240,000, or the total cost of the labor expended on the vessel.

The commission concluded its hearing with an address from Mr. Joseph H. Foad. The commission will meet in Boston during the present week and will, during the latter part of the present month, hold meetings in great lake cities. The commission will meet in Chicago on Friday, June 24, immediately after the adjournment of the Republican convention and will be in session there two days. Meetings will then be held the week following in Detroit and Cleveland, and probably also in Buffalo.

TRADE NOTES.

The F. W. Braun Co., Los Angeles, Cal., are distributing a little booklet entitled "Annealing, Hardening, Tempering and Case Hardening," which contains useful hints regarding these operations that are of considerable interest. The booklet will be mailed to anyone for the asking.

The Falls Hollow Staybolt Co., Cuyahoga Falls, O., have just received a large order from the Norwegian State Railway Co. for both Falls hollow and solid staybolt bars through their agent at Christiania, Norway. This is the third order which the company has received from this railway during the past year. A portion of the raw material from which their hollow and staybolt iron is made is imported from Norway and Sweden. It is then blended with a high grade of native charcoal iron, which gives the combined product the necessary tensile strength and other requirements to make it an excellent grade of staybolt iron.

One of the most difficult problems ever presented in connection with ship building has been that of manufacturing a successful paint to protect the submerged bottoms of iron vessels. Rust is a natural enemy of iron, and salt water increases its enmity to a very great extent, so that the making of a paint that will remain hard under water, possess tenacity enough to contend against the incessant friction, and thus check the ravages of rust, is no easy matter. After the applications of such an anti-corrosive paint comes the difficulty of producing an anti-fouling paint for the second coat. This, it is conceded, must be poisonous in nature, but without harming either the under coat or the iron. Equally difficult with these problems is that of manufacturing an anti-fouling composition to protect the bottom of wooden vessels. Many poisonous ingredients were tried from time to time, until some years ago copper oxide began to gain favor and today it is generally used. If properly manufactured it gives the results desired, but out of the many manufactured copper paints only a few have obtained any degree of success. Marine paint production has become a specialty in the paint line, and today one of the largest and most successful producers is the New Jersey Paint Works (Harry Louderbough, proprietor), Jersey City, N. J., whose productions are now sold all over the world. In their foreign introduction labels in seven foreign languages are used.

PRACTICAL SHIP BUILDING

A. Campbell Holms, who is a member of the Institute of Naval Architects and of the Institute of Engineers & Ship Builders of Scotland and surveyor to Lloyds register of shipping, has prepared a work in two volumes entitled "Practical Ship Building." It is a treatise on the structural design and building of modern steel vessels, following the work of construction from the making of raw material to the equipped vessel, including subsequent up-keep and repairs. The work is in two volumes, the first volume being devoted entirely to the letter press, and the second volume to illustrations and engravings. In order that the utmost clearness might be obtained in the engravings, the second volume is unusual in size, being 13 in. deep and 16 in. wide. The plan of the book is briefly as follows: First, attention is given to the fundamental matters which govern the structural design; the various stresses to which the hull is exposed, their straining tendency and the different structural designs by which the necessary strength to resist them may be secured. Secondly, each important part of the hull is considered by itself, and each one from three points of view, viz., its purpose in the structure and the particular stresses and straining effects to which it is liable; the various formations adopted in its design with the rules governing them as regards scantlings and strength, and a description of the actual work of making it in the ship yard and fitting it in the ship. As Lloyds rules represent and govern, it may be said all merchant shipbuilding practice frequently referred to and explained, the numerous sketches in the book of plates being practically all drawn in conformity therewith. There will be found chapters on corrosion, launching, etc., and on the work of the drawing office, that most important department, where previous to the actual building work the qualities of the ship are decided upon and every part designed and measured on the paper. The volumes are for sale by the Marine Review.

Advices from Cramps are to the effect that the cablegram announcing the stranding of the Turkish cruiser Medjidia near Mitylene is entirely groundless. No accident has happened to the Medjidia.

Rear Admiral Bowles, formerly chief constructor of the navy, will make an examination into the injuries to the battleship Missouri. By the explosion of 2,000 lbs. of powder in the after 12-in. turret of the Missouri about noon on April 13th, twenty-nine men were instantly killed and five others severely injured. The ship was engaged in target practice at the time.